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GAS RATIONING

ONE of the most important topics of to-day is the rationing of fuel. As it affects us in these columns we are particularly concerned with the suggested rationing of gas. We hold to what we said in our issue of March 5 that any government, whatever its colour or whatever its creed, should take steps, in full co-operation with the administrative and technical officers of public utility organizations, to ensure an equitable balance of national fuel resources. In this broad policy gas must play a major part, with, as background, solid smokeless fuel. Such a policy incorporates carbonization entirely, not only by the Gas Industry but also by the Coke Oven Industry—and as a minor asset, at any rate as yet, the Low Temperature Carbonization Industry. The point we would reiterate is that the fuel industry of this country should be considered as a composite whole having loads balanced between the four chief supplying industries—namely, gas, solid smokeless fuel, electricity, and oil, with, of course, as the essential background, the raw material coal.

We said in our issue of March 5 that electricity could not hope to take the heating load adequately. Figures prove this conclusively, and we are sure that for many years ahead a background of solid smokeless fuel is essential to the well-being of the community. Gas has fulfilled its obligations with very little more usage of coal in 1946 compared with 1938. Coke ovens have dealt with demands equally successfully from the point of view of usage of coal. In both cases the coal has deteriorated in quality beyond any expectations of 1938. On the other hand, coal consumption at power stations for the production of electricity, recognized by knowledgeable fuel technicians throughout the world as not an extremely efficient process from the coal conservation point of view, has since 1938 nearly doubled. The quality of the coal which the generating stations are using is known to be of inferior quality, but the fundamental fact remains that the electrical industry has, to put it bluntly, bitten off more than it can or should chew.

After two years of peace, we are back again to war standards of street lighting. Never during the war period were domestic consumers cut off from electricity supply. Now, in time of peace, we are "having it"; and we can see little brightness ahead. The total consumption of coal in this country is not more than it was in 1938, though as we have indicated, its allocation to different industries has appreciably changed. Domestic use of coal or its solid smokeless fuel equivalent has been reduced drastically.

In debates in the House, and from what we gather from reports of private meetings of the Prime Minister and his colleagues and supporters, there is much in the air about gas rationing. The Beveridge Plan, to which we referred at length in the "JOURNAL" of May 6, 1942, has been under renewed and close consideration. This unit plan was detailed in the then Government's Command Paper, No. 6384, dated June 3, 1942. It was, in essence, a coupon scheme, and it may well be that the ordinary consumer of gas or electricity would, if the plan was put in action, be embarrassed by the many implications that any such coupon scheme must necessarily entail. A scheme of the nature would unquestionably result in increased form-filling and a further vast section of the community would be recruited to exercise their faculties of assessment and, incidentally, their pens. We realize that the general public has become, albeit bitterly, acquainted with the coupon and the unit conception. There is, however, a considerable difference between the requirements of an individual for, say, food, and the requirements of an individual for heat. We have little belief in the number of so-called food calories which an individual is allowed to have, because food calories as defined to-day may contain a certain quantity of heat, but entirely lack balance in diet. We suppose that this calorie basis serves some purpose in international discussion, but it does not constitute, to our way of thinking, anything approaching a fundamental basis.

When it comes to the question of heat for the individual, how shall we assess this heat? Ought each man or woman to be treated on the basis of heat input value in relation to where he or she resides? It seems obvious that heat requirements must be related not merely to the individual, but also to the place of abode. Some people may be living at high altitudes, with large rooms which require, for personal comfort, a greater input of heat than modern homes—the most modern of which consists of the prefabricated bungalow where the amount of heat necessary for health and comfort is, in fact, relatively small. In view of this, it is difficult to see how an individual coupon system would in practice react to the general welfare of the public.

There is, of course, woeful lack of coal supplies to public utilities, and there is little doubt that much coal is wasted in the interest of convenience and to the disinterest of health. And we must not forget in an "enlightened" age the enormous bulk of exceedingly important chemicals which can be derived from coal by carbonization. This brings us to consider a scheme of gas rationing—should it be necessary, and it may well be necessary—of a severely practical nature. The basic idea is that a certain reduction in consumption, depending on climatic conditions and several other factors, could be imposed through voluntary action by the public. Such a scale of reduction could be flexible, and with careful usage of gas by the consumer would not involve hardship. This is a major point. In certain circumstances gas pressures would have to be reduced, but under normal

weather conditions such reductions of pressure as might be necessary would not unduly inconvenience the consumer—provided, of course, that the consumer was properly acquainted with the facts and acted in accordance with community well-being. Over-riding all these considerations is the supply of coal to public utility undertakings. Throughout the summer of 1946 not a great deal was done to provide these undertakings with adequate stocks to maintain a reasonable supply throughout even a normal winter, let alone the extremely severe winter which we have experienced in 1946-47, and in fact are still experiencing. This, surely, is a problem for solution by any responsible government.

JOHANNESBURG AND ITS GAS UNDERTAKINGS

THE rapid expansion of the Johannesburg Municipal Gas Undertaking since 1928 is perhaps unique in the history of the Gas Industry. To appreciate the reason for this it is necessary to look at the story of the Municipality itself. Fortunately, we have available a full account of this history by Mr. John P. R. Maud, of University College, Oxford, who was invited in 1935 by the City Council to review the government of Johannesburg during the first 50 years of her existence. In Mr. Maud's "City Government—The Johannesburg Experiment" (Oxford, Clarendon Press) the Author relates her municipal experience to the problems of city government in other parts of the world. The book is long and full and can be recommended to the study of all interested in local government, particularly at this point in our own history when the whole question is likely to come under active review.

Johannesburg dates from 1885, when the Witwatersrand gold reef was discovered at Welgespruit, a little west of the patch of bare veld, the site of what was to become a substantial city and the centre of a metropolitan, highly industrialized region by 1936. In 1890 the European population was just over 10,000. By 1904 it had grown to over 83,000 with 73,000 people of native and other races. Before the opening years of the twentieth century, which marked the conclusion of the troubles and the foundation of the Dominion of South Africa, Johannesburg had little government of any kind. In 1902 such rudimentary governmental organs as were in existence were superseded by a City Council with jurisdiction over an area of some 79 square miles, extended in 1903 to 82. In his book, Mr. Maud maintains there is great significance in this. It gave the new Council control from the start over the whole area not only of the town itself but of the whole of the surrounding rural districts in which any of the people directly interested in the city might be expected to live. The large area made for efficiency and economy and it made for justice, since the main body of municipal expenditure would be shared among all the citizens wherever they happened to live. The Author contrasts this satisfactory position with that of the Tyneside area, of about the same size, where no fewer than 16 local authorities are responsible for all or some of the local government services. Well; there are other examples too. At any rate there will be no disagreement with Mr. Maud's reflection that "once this situation has been allowed to arise it is extremely difficult to find a remedy."

The supply of gas and electricity was left in the hands of concessionaires until 1895, and for many years little was done to develop the gas undertaking. In the year 1914-15 only about 46 million cu.ft. was sold to 447 consumers. But then it began to grow rapidly, and in 1919-20 70½ millions were sold to 548 consumers. It had become evident that the public demand for gas was steadily growing and it was decided to put the undertaking on a sounder footing. In 1926, Mr. B. Sankey, then General Manager, prepared a scheme and specification for a complete new works on the most modern lines to be erected on a new site at Cottesloe.

In the lay-out of the new works advantage was taken of the physical characteristics of the ground, which consisted of a relative thin soil lying above a bed of soft rock sloping markedly down from the railway sidings. Such a conformation lent itself to the arrangement of plant from retort house to holders so as greatly to assist in the gravity flow of the liquids used in and produced as part of the gas-making process. The underlying rock made for cheap foundations, but necessitated steel tanks above ground for the gasholders. Works mains were supported overhead.

The new plant, which was inaugurated in 1928, was laid out in one line with carbonizing plant in the form of Glover-West continuous verticals of a nominal daily capacity of 1,350,000 cu.ft. The wet purification plant was designed for a daily capacity of two millions and was arranged for duplication throughout. It comprised the usual water-cooled condensers, P. & A. tar extractor, Livesey washer, and rotary washer, to which was added later an electrostatic tar precipitator. Dry purifiers of the same capacity were arranged above ground with mechanical handling for oxide and lids. The two gasholders were built with two lifts (arranged for the ultimate addition of a third) with a capacity of ½ million each. It was well that in the design provision was made for extension on a generous scale, for in 1935 it was necessary to double the original capacity and immediately after, in 1936, to add a further unit of equal capacity. This exhausted the possibilities of the original lay-out and in 1942 designs were prepared for an entirely new set of plant, with carbonizing plant of the same type but with larger retorts of a nominal daily capacity of 1,440,000 cu.ft. bringing the total effective daily capacity after allowing for scurfing, and so on, to about 5 million cu.ft. On the new line generous provision is also made for duplication and extension. That it will certainly be necessary is emphasized by the fact that the production of 137 millions in 1928-29 had already grown to 1,367 millions by 1945-46, an increase of more than 7% over the production of the previous year. The maximum quantity of gas sent out during any one 24 hour period—in August, 1946—was 5,142,103 cu.ft. On that day every available retort was in production supplemented by the carburetted water gas plant, which normally is kept in reserve for emergencies. And the new plant is not yet ready for gas-making. Johannesburg has clearly advanced to be one of the greater gas undertakings of the Empire.

There are many interesting features in this. Storage now aggregates 4 millions in three holders and a contract has been placed for another with a capacity of 3 millions. It is interesting to note that this vessel is to be fabricated in South African steel. It is anticipated that it will be ready to take gas by the middle of 1948, when the total storage capacity will be 7 million cu.ft.

Mr. J. G. Curnow, the Engineer, under whose direction most of this phenomenal expansion and extension has taken place, is South African born and trained. He will shortly be in this country, where he will be given a warm welcome.

ADVICE ON FUEL

A STRONG team of fuel experts, headed by Mr. Robert Foot, formerly General Manager of the Gas Light and Coke Company and latterly Chairman of the Mining Association, Mr. W. L. Boon, until recently General Manager of the London and Counties Coke Association, Mr. J. G. Bennett, Director of the British Coal Utilization Research Association, and Mr. E L. Hann, Chairman and Managing Director of the Powell Duffryn Group, has been chosen to advise industry on the efficient and economical use of all types of fuels and to act as consultants on any aspect of coal mining anywhere in the world. Nationalization has removed the coal mines from private ownership, but it has been left largely to individual initiative and enterprise to ensure the maximum efficiency in the distribution and use of what is produced from the mines.

Dispossessed of its mines by nationalization, the Powell Duffryn Group retains not only its exporting, marketing, and

bunkering interests, but also its service organization for promoting efficient fuel utilization, and intends to extend its activities in commercial fields. To make the best use of these assets in the changed conditions, it was thought that a new organization was called for, and last week there was registered a new subsidiary Company with the name of Powell Duffryn Technical Services, Ltd., with Mr. Foot as Chairman. The specific purposes for which the new Company has been formed are set out in its Memorandum of Association. Briefly, the aim is to create a large-scale organization equipped to act as independent and impartial consultants with the necessary knowledge and technical experience to operate throughout the world over the whole range of problems which fall broadly within the definition of fuel production, distribution, and utilization.

The organization will deal not only with coal, but with all forms of fuel, and will tackle the problems of heat and power utilization in the individual factory. It will investigate and advise on the changes to be made and the economies to be achieved, arrange and supervise the installation, where necessary, of new plant, and generally see the job through from beginning to end. The advisory work of the new Company will be complementary to the valuable work being done by the Fuel Efficiency Division of the Ministry of Fuel and Power. The Economic Survey for 1947 in its conclusion states that "the central problem is coal and power, and upon this everything else depends." Mr. Foot and his collaborators regard the launching of the new Powell Duffryn enterprise as a timely and useful contribution towards its solution, and feel that if other industrial managements equally make it their business to concentrate in a practical way on their own share of the "coal and power problem," there is still room for optimism. "There have been enough words and White Papers," said Mr. Foot at an introductory Press conference last week. "What we want now are deeds. Whatever may be the effort involved, it is vital for our national survival that we drastically overhaul our methods."

Using Coal Efficiently

We are glad to give prominence in our issue to-day to correspondence which has recently been published in the *Manchester Guardian* on the subject of the best use of coal. There exists a general complacency towards coal burning, and a vast proportion of the public appears to think that the country's prosperity *vis a vis* the coal problem can be aided only by the building of a number of super power stations as soon as possible, the superior thermal efficiency of gas production and its proper claims regarding the manufacture of materials from coal which are vital to the welfare of the nation being all too lightly dismissed. Is it that the Gas Industry, *qua* Industry, is too modest, preferring the shirt cuff to the pulled-up shirt sleeve? We are certain that the Industry has a case which it should put forward with vigour and conviction, irrespective of party politics, irrespective of the veering of the wind.

Personal

Directors and staff of the Ilfracombe Gas Company made a presentation to Mr. M. G. SNASHALL, District Superintendent, on his retirement after 38 years' service.

* * *

The Directors of A. H. Sutherland, Ltd., announce the retirement of Mr. B. E. MACE from the position of Managing Director as from Dec. 31 last. Mr. Mace will continue as Chairman. Mr. W. D. CHESHIRE has been appointed to succeed Mr. Mace as Managing Director.

* * *

Mr. STEWART C. COUBROUGH, Engineer and Manager of the Kirriemuir Gas Company, has been appointed Engineer and Manager of Lockerbie Gas Department in succession to Mr. J. WEBSTER, who has gone to Burntisland. Mr. Coubrough began his career at Alyth, where his father was Gas Manager, and later gained experience with the Kibworth Gas Company before going to Kirriemuir.

Letters to the Editor

Holding Companies' Proposals

SIR,—In view of the enquiries which are being received from within and without the Gas Industry as to the views of the British Gas Council on the published proposals of the Association of Gas Corporations for the "Re-organization of the Gas Industry," I have been instructed by my Executive Committee to say that, at the request of the Association, these proposals were communicated by the Council to the Ministry of Fuel and Power, without comment. Subsequently the Association caused its proposals to be published and circulated among gas undertakings.

Since the British Gas Council is discussing all aspects of the future structure of the Gas Industry with the Ministry of Fuel and Power, the Council considers itself to be precluded from publishing any views on the proposals of the Holding Companies for the re-organization of the Industry.

Yours faithfully,
J. R. W. ALEXANDER,
General Manager,
British Gas Council.

1, Grosvenor Place,
S.W.1.
Mar. 10, 1947.

Intermittent Vertical Retorts

DEAR SIR,—From statements which have appeared recently from time to time in the Technical Press, it would appear that misconceptions exist as to the capabilities and advantages of intermittent vertical chambers as carbonizing plant in gas-works. It would appear to the writer advisable to recapitulate the advantages pertaining to this type of carbonizing plant for the benefit of those who propose installing new carbonizing plant in the future.

1. *The ability to carbonize any type of coal.*

This is, of course, widely recognized, though perhaps not sufficiently appreciated, but there appears to exist a belief that the gas-making capacity varies with the grading of coal used. For example, it has been stated that when carbonizing nuts the gaseous thermal output per chamber is less than when carbonizing run-of-mine, this statement being based on the fact that the bulk density of run-of-mine is greater than that of nuts, so that the chamber holds less coal in the latter case.

This latter statement is perfectly true, but takes no account of the fact that the carbonization of nuts proceeds appreciably more quickly than that of run-of-mine coal; consequently the carbonizing time in the case of the less dense charge is reduced at least in proportion to the reduction in coal density, so that, assuming the yield per ton is the same in both cases, both types of coal will yield the same gaseous thermal output per chamber.

2. *An intermittent vertical chamber plant gives a higher gaseous thermal yield per ton of coal carbonized than a continuous vertical retort plant.*

This percentage increase in yield depends on the calorific value of gas being made. At the most general calorific values—*i.e.*, those in the range of 500 B.Th.U. per cu.ft.—it is of the order of 5% (see Paper by Grogono and Finlayson, Transactions of the Institution of Gas Engineers, 1938-39, Fig. 1, p. 1017). In these days of coal shortage, this, of course, is a material factor, amounting, for example, in the case of a 7 million cu.ft. per day plant to 10,000 tons of coal per year saved by the installation of intermittent chambers.

3. *Intermittent vertical chamber plants are very flexible as regards variation in output.*

There are a number of installations in this country where the output is varied from full load down to 40% of full load, without shutting down any part of the plant.

4. *As compared with other types of carbonizing plant, intermittent vertical chambers require less labour.*

The saving depends on the size of plant. For example, a 7 million per day plant is of the order of 10 men per day.

5. *The gasification of oil in conjunction with the normal carbonization processes can only be efficiently carried out in intermittent vertical chambers.*

The adoption of this process saves coal (see letter by Mr. Scott, of Canterbury, in the issue of the "GAS JOURNAL" of Jan. 1, 1947), and this is or should be a vital factor these days.

Yours faithfully,
ARTHUR H. LYMN.

Artillery House,
London, S.W.1.
Mar. 7, 1947.

Manchester City Council has given a contract for a complete vertical retort installation, complete with outside mechanical producers, for erection at Bradford Road Works. The acceptance of this tender means that the Department now has plant on order with a capacity of 10 million cu.ft. per day additional to the present capacity.

News in Brief

An Interim Dividend of 5s. per share has been declared by the Metropolitan Gas Company, Melbourne, states a cable received by William Coward & Co., Ltd., the Company's London agents.

A Threatened Strike of Cork gas workers has been averted. A meeting of the workers decided to suspend the notice of withdrawal of labour on the assurance by the Lord Mayor that the Gas Company would meet representatives of the men. This was done and the Lord Mayor announced that the investigation was proceeding with the co-operation of both sides.

Stretford and District Gas Board has just concluded a successful series of lectures at its Urmston showrooms. The subjects covered were "Nutrition in the Home," "New Homes for Old," "Rayon in the Home," and "Let's Plan for To-morrow." Local housewives attended in large numbers and the inclusion of appropriate films created added interest.

A New 24 in. Gas Main is proposed by Middlesbrough Corporation from the Cannon Street gas main to meet the growing needs following developments to the east of Middlesbrough. The work will cost over £66,000, plus £4,000 for two governors. The Ministry of Fuel and Power is to offer an interest-free loan to the Corporation for the laying of an 18 in. main from South Bank Road and Cargo Fleet Lane to meet the needs of the new East Middlesbrough trading estate.

The Leamington Priors Gas Company has this winter, with the co-operation of appliance makers, resumed evening lectures once a month to gas fitters and other interested employees on gas appliances in general use on the district, particularly the newer models. These lectures are proving popular and very useful. One was given in January by Mr. Wadsworth, who was accompanied by Mr. Green, of Ewart & Son, Ltd., and one in February by Mr. Taylor, Ascot Gas Water Heaters, Ltd., who was accompanied by Mr. Perks.

Mr. J. W. Pallister, Middlesbrough Corporation Gas Engineer, in a statement regarding local gas supplies, said that gas was being consumed at a fantastic rate, exceeding nine million cu.ft. daily at the heaviest periods. When it was mentioned that the nominal capacity of the plant was six and a half million cu.ft. daily, it would be appreciated what a heavy strain was being put on the undertaking and on the staff. As Middlesbrough's gas rates were the lowest in the country, it was natural that consumers should depend more on gas for cooking, heating and washing than on any other type of fuel.

"Gas Cookers" was the subject taken by Mr. F. Brinsley, Technical Service Manager of Radiation, Ltd., for the second of his series of three lectures to the outdoor staff of the Sheffield and District Gas Company. Addressing an audience of over 60 employees he described the evolution in cooker construction from the year 1880. Mr. Brinsley said that in 1890 Mr. Fletcher (founder of Fletcher, Russell & Co., Ltd.) introduced the bunsen flame to both oven and hot plate. The speaker then went on to illustrate the flow of gases in each type of oven, and explained the various technical points concerning top and bottom flues, heat zones and single and double burner ovens. He then dealt with the construction and action of thermostats, concluding his talk by giving a brief survey of the evolution of gas taps, including the vertical spring loaded type which are now being fitted to modern apparatus.

"In All Branches of Chemistry we look back on a wonderful century in which men of many countries worked with a common aim. Yet it is well to contrast their achievements with the state of the world to-day. How can we apply the knowledge chemists have won to solving world-wide malnutrition and endemic disease? How can we ensure that the same effort is diverted to the well-being of the world as made chemistry such a potent factor in war?" Our quotation is from the commemorative address entitled "A Centenary of Chemistry" delivered by Sir Harold Hartley, K.C.V.O., M.C., F.R.S., at a joint meeting of the Royal Society of Arts and the Chemical Society. The meeting was held at the Royal Society of Arts, which was the venue of the first meeting of the Chemical Society in 1841.

The First Meeting of a Scottish Inter-Departmental Committee on Domestic Heating, which has been formed to obtain and co-ordinate information regarding Scotland required by a corresponding United Kingdom Committee, was held in St. Andrews House, Edinburgh. Sir Patrick J. Dollan, Chairman of the Scottish Fuel Efficiency Committee, and representatives of the Ministry of Fuel and Power, Ministry of Supply, Ministry of Works, and the Department of Health for Scotland were present. The United Kingdon Committee has been in existence for some time and the purpose of its Scottish counterpart is to consider how far any decisions made with regard to the rest of the country, are desirable for Scotland. It was emphasized that the meeting was in no way concerned with the present fuel crisis. The matters under consideration concerned the most economical way of providing domestic heating, and among the questions considered was what could be done to introduce new fuel-saving devices to future and existing houses. As a result of the meeting, the Department of Health for Scotland will advocate the use of open stoves, closed fires, and convection heating to Scottish Local Authorities, as these are more economical than traditional methods.

Regional Conferences on Industry and Research, a series of which are planned in the near future, will be sponsored by the Federation of British Industries. The first will be held at Birmingham on Mar. 25.

Proposals for the Installation of Larger Plant at the works of the Spalding Gas Department have received the approval of the Ministry of Fuel and Power. The Gas Committee has accepted a tender from the Woodall-Duckham Company for completion of the work in 24 to 27 months, and has asked Mr. F. Harvey, Engineer and Manager, to prepare detailed estimates for the proposed work.

The Aluminium Wire and Cable Co., Ltd., which was formed recently by the British Aluminium Co., Ltd., Hawker Siddeley Aircraft Co., Ltd., and Tube Investments, Ltd., has arranged to purchase premises at Port Tennant, Swansea, from the Ministry of Supply and will enter into occupation from May 1. It is anticipated that production will start towards the end of the year. The Company has offices, temporarily, at Salisbury House, Circus Place, London Wall, E.C.2.

Addressing a Meeting of the Gainsborough and District Citizens' Association on Feb. 18, Mr. H. Shackleton, Manager of the Gainsborough Council's Gas Department, revealed that in the 100 years existence of the gas-works, output had risen from 4,500,000 cu.ft. to 200,000,000 cu.ft. a year. The gas-works were brought in 1899 by the Council for £87,000 and the total capital expenditure to-day was just under £200,000. Apart from £50,000 the capital had been repaid out of revenue. In spite of a recent increase in the price of gas to consumers the price was still one of the lowest in the country.

Members of Staffs of gas undertakings in the South West attended a meeting at Bristol on Feb. 8 and were addressed by Mr. H. J. Arnold, General Secretary of the British Gas Staff Association, on the objects and aims of the Association. After the meeting a provisional South Western Regional Council was formed, Mr. H. G. Higgs (Salisbury) being elected Chairman and Mr. H. V. White (Wotton-under-Edge) Secretary. Several new branches are expected to be formed as a result of the meeting. Another meeting was held at Plymouth on Mar. 1 for gas staffs in the extreme South West.

During the Fuel Crisis George Wilson Gas Meters, Ltd., managed to keep certain essential machines going by the use of diesel engines. They had converted their machines to self-contained units from a line shaft drive, and were, therefore, faced with the necessity of re-converting to belt-driven, although by the addition of an alternator they were able to work a number of self-contained machines, which had been recently installed to bring the plant into line with modern conditions for accurate and economical production. Great credit is due to the workers during this period of difficulty, since unhappily the firm was also suffering from a shortage of solid fuel, and conditions in the shops were "Arctic." Nevertheless, by the co-operation of all concerned the main works were able to maintain in employment approximately 250 persons. Production, however, was seriously interfered with.

Diary

Mar. 20.—Midland Association of Gas Engineers and Managers: Annual General Meeting. Queen's Hotel, Birmingham, 2.30 p.m.

Mar. 21.—London and Southern District Junior Gas Association: Reception and Dance. Caxton Hall, Westminster, 6.30 p.m.

Mar. 22.—London and Southern District Junior Gas Association: Convention (Technical Conference). Gas Industry House, 9.30 a.m.

Mar. 22.—Midland Junior Gas Association: President's Day.

Mar. 22.—Manchester and District Junior Gas Association: Joint visit with Midland Junior Gas Association. Morning visits to British Refractories Research Laboratories and Gas-fired Pottery Works; afternoon visit to Stoke-on-Trent Gas-works.

Mar. 25.—Southern Association of Gas Engineers and Managers (Eastern District): "Experiences with a New Type of Coke Extractor on Vertical Retorts," W. W. Chisholm (Slough). Gas Industry House, 2.30 p.m.

Mar. 27.—Industrial Gas Development Committee, 10.30 a.m., Gas Industry House.

Mar. 27.—Midland Counties Coke Association: Annual General Meeting, King Edward House, Birmingham, 2.30 p.m.

Apr. 14.—London and Counties Coke Association: Technical Committee, 2.30 p.m Gas Industry House

Apr. 15.—National Federation of Gas Coke Associations: General Committee, 10 a.m.; National Technical Committee, 11.30 a.m. Gas Industry House.

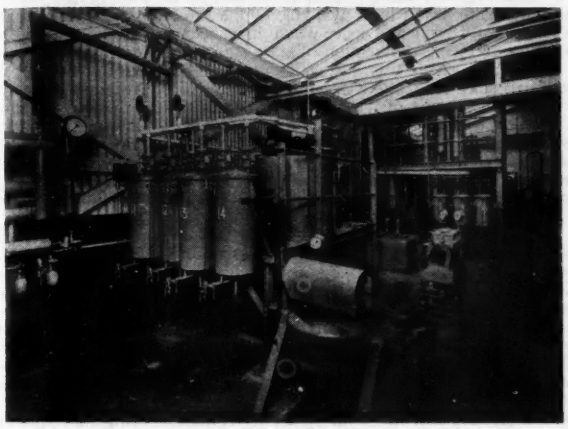
Apr. 15.—Solid Smokeless Fuels Federation: Technical Committee, Gas Industry House, 2.45 p.m.

Brotherton Chemical Engineering Laboratory at Leeds University

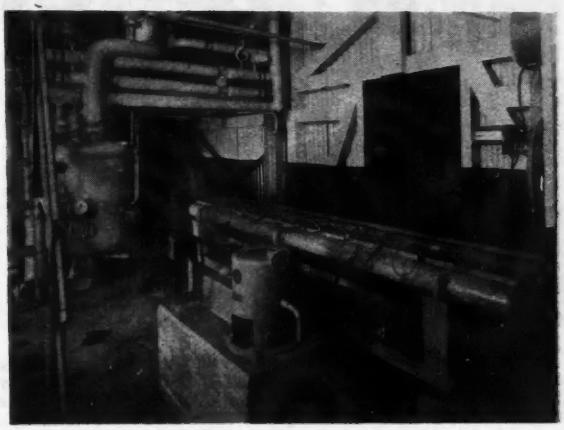
An event of considerable importance was the recent opening of the Charles Brotherton Chemical Engineering Laboratory at Leeds University. Since the institution of degree courses in Chemical Engineering by the University in 1942, the Department of Coal Gas and Fuel Industries has been acquiring additional items of chemical plant to equip a special laboratory for the study of unit operations. Despite the difficulties of obtaining apparatus, the task was finally completed and equipment covering most of the principal chemical engineering operations was procured.

The equipping of the new laboratory was possible because of the generosity of Mr. Charles Brotherton and Messrs. Brotherton & Co., who provided £55,000 towards the cost of a new building when this is possible, and also gifts for chemical engineering equipment and endowments to provide staff.

Some indication of the thoroughness with which this enterprise has been carried out will be seen from the accompanying photographs.

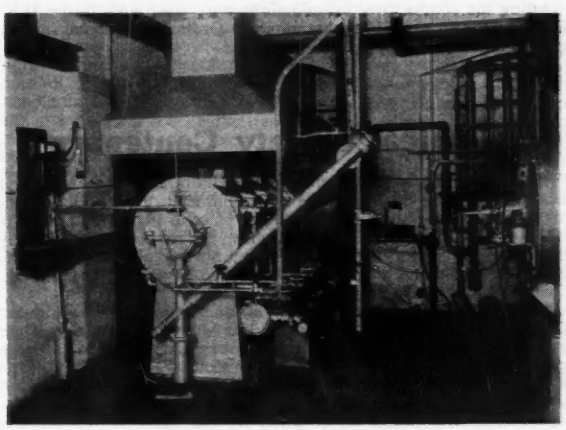


The concentric-tube heat exchanger, rotary vacuum filter, enamelled jacketted pan, and filter press.



The rocking crystallizer, centrifuge, and kettle for fractionating column.

The tray drier, film drier, super-centrifuge, and kneading type mixer.



The Corbett Woodall laboratory, showing the 30 lb. carbonization retort with condensers and purification train.

The units are sufficiently large to ensure a performance and technique of operation similar to that of commercial plant, and in addition are provided with a full range of measuring instruments. Installations include a double-effect evaporator, still and fractionating column, rocking crystallizer, centrifuge, filter press and rotary vacuum filter, jacketted pan, heat interchanger, tray drier, double-drum film drier, kneading type mixer, and a super-centrifuge. Extreme congestion has necessitated housing some of the equipment in out-buildings, but most of it is accommodated in an annexe to the main building which has been named the Charles Brotherton Chemical Engineering Laboratory.

The present location is temporary, and when conditions permit the whole of the equipment will be transferred to an adequate and permanent building.

The Second Brotherton Lecture of the Society of Chemical Industry was delivered in Leeds by Dr. D. T. A. Townend, and the opportunity was taken of arranging for the temporary Chemical Engineering Laboratory to be formally opened prior to the delivery of the Brotherton Lecture.

Training of Engineers

Mr. T. B. Sansom, of Bruce Peebles Co., Ltd., in his lecture to the Scottish Engineering Students' Association in Edinburgh on Feb. 7 stressed the need for organized training arrangements for apprentices and students of engineering. He outlined the methods that are in use to-day and those that could be put into use providing the industrialists would co-operate with the colleges. He also described the qualifications necessary for a successful liaison officer between the industrial concern and the place of study.

He discussed at length the merits and disadvantages of the Degree Course in Engineering, finally suggesting a system that would both have the advantages of University training without the disadvantages of not being able to fulfil the conditions of a five-year apprenticeship. In conclusion he quoted two examples taken from the training schemes employed by Metropolitan Vickers and A. Reyrolle & Co. This allowed the members of the Association to judge for themselves the gap that existed between the theoretical ideal and the practical application.

Home Laundry Lessons

Home service advisers of the United Kingdom Gas Corporation recently received a two-day course of instruction in home laundry, including the treatment of fabrics and the selling of washing machines, sponsored by the Rinso Wash-Testing Laboratories, at Bebington, Cheshire.

Home Service Advisers (left to right): Miss J. M. Jones (United Kingdom Gas Corporation), Miss J. Webb (Manchester Corporation, Visitor), Miss D. Mungovin (Pudsey Gas Company), Miss E. Sagar (North Cheshire Group of Gas Companies), Mrs. C. Dearden (Radcliffe, Farnworth and District Gas Company), Miss K. Smith (York, Harrogate and District Group of Gas Companies), Miss D. M. Inglis (Scarborough and Bridlington Gas Companies), Miss B. Broadhurst (Runcorn Group of Gas Companies).

During the course three examinations were given and all the U.K. advisers were successful in obtaining the Ordinary Diploma and the Special Distinction Diploma.

Chemical Society Centenary

The programme of the Centenary Celebrations of the Chemical Society on July 15-17 has now been published. These celebrations which, but for the war, would have taken place in 1941, are marked by a number of important events emphasizing the position of the Society and of chemistry in Britain to-day. The Society was the first of its kind in the world and the history of the first 100 years of its life is one of which it may justly be proud.

Delegates from many countries will attend and formal addresses of congratulations will be presented. His Majesty's Government are to mark the occasion by entertaining the overseas delegates to luncheon and by giving a garden party at Hampton Court Palace to the Fellows of the Society and members of the XIth International Congress of Pure and Applied Chemistry, which is to follow the celebrations.

By means of a dinner to be given by the University of London and a reception by the Royal Society to the Chemical Society and the Congress, the academic world and the senior scientific society of Great Britain will contribute to the occasion. The Royal Institution will give a sherry party on July 17 to distinguished visitors from overseas. The principal social event will be the Centenary Dinner.

The scientific events of the programme include the Faraday Lecture by Sir Robert Robinson, President of the Royal Society, lectures of a historical nature and visits to places of scientific interest in the London area. An exhibition in the Science Museum, South Kensington, which will be open to the public until the end of September, will illustrate the achievements of British chemistry during the past 100 years and its importance to the everyday life of the community.

A Series of Three Food Leader Classes, organized by the Ministry of Food, were given recently in the Barnsley Showrooms of the Sheffield and District Gas Company. Each class consisted of a lecture, followed by a practical demonstration by Miss Taylor (Food Advice Centre, Doncaster), Miss Jones (West Riding County Council), and Miss Nightingale (Chief Demonstrator, Food Advice Centre, Doncaster) respectively. Miss Chapman, Area Organizer of the Ministry of Food, in presenting Food Leader badges after the lectures, said that there are now 24,000 Food Leaders in the country, 1,500 of them being in the Doncaster area (which includes Barnsley).

British Industries Fair

The first post-war British Industries Fair will open simultaneously in London and Birmingham on May 5 and will remain open until May 16. A record number of 3,131 manufacturers will occupy 920,404 sq. ft. of exhibition space in the greatest national trade fair ever held. The close support of industry for a display on such a scale after only 21 months of peace indicates that this annual event will form the spearhead of the national export drive.

In the London section, where the lighter industries will be represented, there will be 1,287 exhibitors at Olympia and 866 at Earls Court, and 978 manufacturers will be represented in the engineering and hardware section at Castle Bromwich, Birmingham. So numerous were the applications received by the closing date that if accommodation had been available in the three buildings more than a million sq. ft. of stand space would have been occupied. Exhibitors are now receiving notification of their stand sites and numbers.

The Fair, which was suspended during the war, has been held regularly since 1915, and is organized by the Export Promotion Department of the Board of Trade in collaboration with the Birmingham Chamber of Commerce. Its expansion has been remarkable. In 1939 when the last Fair was held, there were 2,300 exhibitors. The total occupied space was over 800,000 sq. ft., or nearly ten times that occupied in 1915, with more than four times as many exhibitors; the total attendance at all three centres was 340,871, including nearly 7,000 buyers from 77 countries.

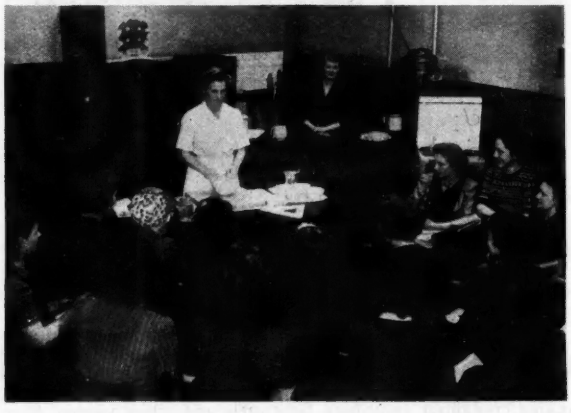
As the Fair will be held this year in May instead of February, it is hoped that visitors to the United Kingdom will be encouraged to combine business with a holiday tour of Britain. The Travel Association will have officers on duty (at the Overseas Buyers Clubs) to advise on holidays.

A Swedish shipping company has solved the hotel accommodation problem for Scandinavian visitors. Two of its vessels, sailing from Gothenburg, will anchor in the Thames. Thus passengers will be able to visit the Fair each day and return to their ship each night. Another company has arranged to make a 10% rebate for the return journey on the Esbjerg-Harwich route, the only condition being that visitors must produce their British Industries Fair invitation card when booking their passage. A third line sailing from Oslo and Gothenburg has agreed to issue return tickets at single fare plus one third rate.

No previous British Industries Fair has offered the overseas buyer so many developments to see and to discuss with the manufacturer. At the Fair of 1947 buyers will inform themselves and prepare for sound business decisions in the years when quantity will increase and buying policy will depend upon advance knowledge.

Homecraft for Factory Girls

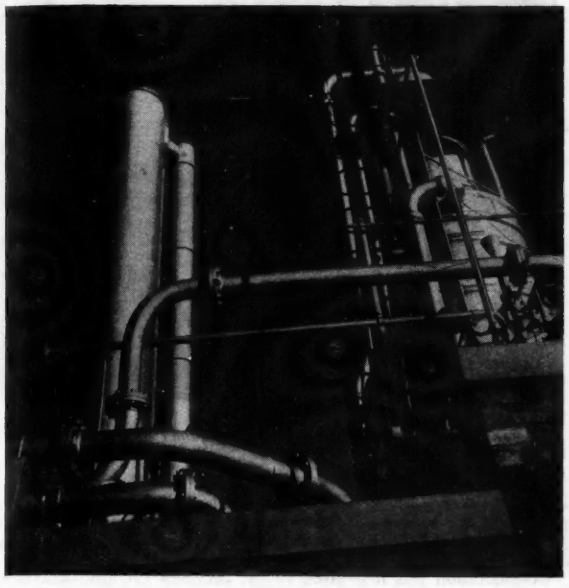
Reporting on the activities of the Home Service Bureau of the Sheffield and District Gas Company, the *Thorncliffe News*, issued by Newton Chambers & Co., Ltd., Thorncliffe, states:



Miss J. E. Smith, of the Sheffield and District Gas Company's Home Service Bureau, conducting one of a series of classes arranged for the benefit of female employees of Newton, Chambers & Co., Ltd.

" One-week courses, with the accent on homecraft, but incorporating some of the subjects included in the business training pre-entry scheme, are now operating for girls from the Izal factory and chemical works. A feature is practical instruction in cookery, conducted by Miss J. E. Smith and Miss S. J. Woodcock, from the Sheffield and District Gas Company. We joined the first training group at tea. In no time we were being plied with a tempting selection of table delicacies which, upon investigation, proved quite as delicious as they looked. Mr. H. E. G. West, the Managing Director, thanking the girls for their hospitality, expressed admiration of their efforts, and said he hoped the course would prove useful in their home life."

Holmes—G.L.C.C. Benzole Recovery Plant at Liverpool Gas Company's Garston Works



Tower scrubbers and still.

THE Liverpool Gas Company has for years approved the policy of reducing the organic sulphur content of the gas supplied, but it is only recently that the first steps have been taken to implement this policy. The procedure which may be applied for this purpose indicates that a reduction of sulphur to approximately 10 grains per 100 cu.ft. is economically associated with the maximum possible recovery of benzole.[1] Further reduction is dependent on the use of a catalytic process which seems now to have reached a stage of development at which it may be applied on the large scale. If the catalytic process can be operated prior to the recovery of benzole then considerable additional advantage results from the production of crude benzole of low sulphur content.

With the future possibilities in mind it was decided to install a plant designed under the patent specification of the Gas Light and Coke Company (B.P. No. 443,094) by Messrs. W. C. Holmes & Co., Ltd., using a tower scrubber with high oil circulation and vacuum distillation.

The gas making capacity of the coal carbonization plant at the Garston Works of the Company was 7.5 million cu.ft. per day and the benzole-sulphur recovery plant was designed for this volume of gas. The gas consisted of a mixture of vertical and horizontal coal gas, and the calculations envisaged a continuous recovery of 90% of the benzole content of the gas and the removal of 85% of the organic sulphur compounds other than carbon oxysulphide and similar volatile compounds.

A review of the future steam position on the works indicated that a supply of exhaust steam would be available which would be adequate for the recovery process by this method, without the more usual arrangement where steam turbines are used for the pump drives with the exhaust applied to the oil stripping. The plant was, therefore, designed to be operated entirely by electric motors and is unique in this respect.

The Plant Described

Scrubber.—The gas is washed in a tower scrubber 9 ft. diam. by 95 ft. high of riveted mild steel construction. The wood filling is most efficiently irrigated by the Silver distributor.[2] The scrubber is placed in the gas stream at the outlet of meters with the distillation plant, oil cooler, and water cooling tower on adjacent sites.

Oil Distillation Plant.—The oil circulation required for the removal of CS_2 is approximately 300 gall. per 10^4 cu.ft. of gas and the pumping equipment is capable of circulating 9,000 gall. per hour, the washing medium being gas oil of normal commercial quality (S.G. 0.875, Redwood Viscosity 45 sec. at 70° F.).

Layout.—The pumps are housed in a building which is divided by partitions to form an inner room containing the pumps, and an outer room, 10 ft. wide of "L" shape along two sides of the pump room, where the motors and instrument panel are installed. The partitions are of tiled brick to a height of 3 ft. 6 in., glazed above. There are no electrical connexions whatever in the pump room and no benzole, oil, or water pipes in the motor room. Access to the pump room is obtained only from out-of-doors and there is no access between the two rooms. A staircase leads from the pump room to the flat reinforced concrete roof which carries the still preheaters, condensers, and separator. Alternative access to the roof is also provided outside from ground level via a staircase and platform over the benzole and oil storage tanks which are installed in the open. The pump and motor rooms are finished with red tiled floors, cream tiled wall to 4 ft. 6 in., with painted plaster above.

The pumps are diven from the motors by shafts passing through specially designed gland sealing boxes in the partition so that benzole vapours or inflammable gases are excluded from the motor room.

Pumps.—The pumping equipment, with the exception of the benzole loading pump, is duplicated. The hot D.B.C. pump, the cold B.O. pump, cold water pump, and hot water pump were supplied by Worthington Simpson and are assembled in tandem by flexible couplings on a common bed plate. Each four-pump unit is driven through a multi "V" belt by a 55 h.p. gas-works type motor of Lancashire Dyanamo and Crypto manufacture. This combined drive has certain undesirable mechanical features which are appreciated, but the arrangement enabled the present compact layout to be attained on a restricted site while providing also for future extension.

The "Aquair" rotary vacuum pumps, supplied by Drysdale & Co., Ltd., are each capable of handling about 8,000 cu.ft. per hour of gas while maintaining a vacuum of 21 in. mercury when running at a speed of 1,450 r.p.m. and simultaneously delivering the mixture of benzole and water flowing from the condensers. The condensate is discharged into a rectangular tank, from which it is removed by a small centrifugal pump driven by an extension of the vacuum pump shaft. The benzole water mixture is thus delivered to a separator on the roof. Each vacuum-centrifugal condensate pump unit is driven directly by a 15 h.p. motor, a common receiver and cooling coil being used so that the pumps are maintained full of water by recirculation should the volume of liquid fall below the immediate requirements. A further small centrifugal pump is directly driven by a 2 h.p. motor and is capable of delivering 4,000 gall. of benzole per hour to loading points for either road or rail transport.

Preheating Equipment and Distillation Unit.—The cold benzolized oil flows by gravity from the base of the scrubber to the benzolized oil tank (5,000 gall.) from which it is removed by the benzolized oil pump. It passes first to the vapour oil heat exchanger which is fitted on the top of the still. This heater is of the shell and tube type, the headers being so arranged that the oil within the tubes is given several passes, the heating medium being the vapours leaving the still. Further heating is obtained in three oil-oil heat exchangers arranged in series at ground level. In this case the tube nest is carried into a floating header. The heat exchange here is between the benzolized oil and the hot debenzolized oil flowing from the still. The final heating takes place in two exhaust steam preheaters connected in series. These also are of the shell and tube type, the steam passing on the outside of the tubes. The benzolized oil enters the still at a temperature of approximately 85° C.

The debenzolized oil is removed from the reservoir at the base of the still by the hot debenzolized oil pump and delivered via the oil-oil heat exchangers and the coolers to the distributor at the top of the tower scrubber.

The oil stripping still is 8 ft. diameter and 32 ft. 6 in. high overall including the separator section. It consists of 12 bubble cap trays mounted on a base of the same diameter which serves as an oil receiving chamber and reservoir for the priming of the hot debenzolized oil pump. The oil flow is controlled by two float valves attached to the still. One of these operates on the benzolized oil pipe line and the other on the debenzolized line. The combined operation of these valves ensures that the oil level in the base of the still is maintained within predefined limits.

The top section of the still contains a separator which receives the condensate from the vapour-oil heat exchanger mounted above. The system is arranged so that separation of this primary condensate is effected within the still. The oil (naphtha) may be returned directly

[1] Trans. Inst. Gas E. 1936-37. 86. 481.

[2] B.P. 487,946, B.P. 550,406, Reg. design No. 837,688.

to the top of the still while the water flows via a barometric leg to a second separator situated above the storage tanks. Alternatively, the oil may flow together with water down the barometric leg to the atmospheric separator, from which it would flow to storage. Adjustment of the proportion of this primary condensate retained within the still provides an additional control of the quality of the crude benzole.

The benzole condensers are of similar construction to the steam heaters. The headers are arranged to give the water a large number of passes, and, in addition, there is an internal baffle plate to control the movement of the vapours inside the shell.

The condensate is removed from the system via the vacuum pump, and discharged by the centrifugal pump to the receiver, from which it flows to the separator. The benzole may then be directed to either of the two storage tanks which have a total capacity of 16,000 gall. These tanks together with the benzolized oil tank are situated in a compound at the rear of the pump house.

Cooling System.—The final cooling of the oil takes place in seven series of cast iron serpentine racks, each 18 ft. long and 35 pipes high. The seven units operate in parallel, each being surmounted by a galvanized steel water distributing trough.

A closed cooling water system is used. The warm water is pumped from a pond below the oil coolers and passes to a Bradford patent forced draught cooling tower which consists of a reinforced concrete shell with timber filling. When the natural air supply is inadequate, the air flow is augmented by a 7 ft. dia. wooden air screw driven directly by a 9 h.p. motor. The tower is capable of cooling 15,000 gall. of water per hour through 30° F. to within 5° F. of the wet bulb temperature.

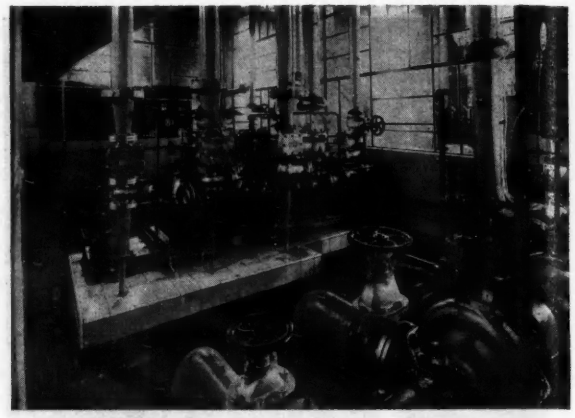
The plant has been operating since October, 1946, during which period abnormal growth of algae would not be anticipated. There has, however, been some indication of growth, which has been inhibited by the use of sodium pantachlorphensate ("Santobrite," supplied by the Monsanto Chemical Company). This chemical is widely used for the prevention of algae growth and it will be tested more severely under the conditions prevailing during the summer. If it is found that the loss from the system is excessive it is intended to use chlorine either in a continuous small concentration or intermittently at a high concentration.

Steam Supply.—The steam requirements are provided from the works low pressure main at 10 lb./in. This main receives the exhaust from other plant and any surplus passes via an automatic valve to the steam heater on the boiler water treatment plant. Provision is, however, made to maintain the supply to the benzole plant directly from the high pressure main through a Hopkinson reducing valve in case of failure of the low pressure supply.

Electrical Equipment.—It has already been indicated that the exclusive use of electric motor driven pumps in a plant of this type is believed to be unique in the Gas Industry.

Electric power is supplied to the works at 6,000 volts by the Local Authority, the bulk of the equipment having been converted to operate on A.C. at 400 v. The current is transformed and rectified where necessary for the individual plant, and local stand-by generators are available to operate the plant necessary to maintain the gas making process in case of breakdown of the grid supply. In these circumstances the unit cost is low, and with this source of power available it was concluded that the cost would be similar to that incurred by the use of steam turbines and that operative maintenance costs would be lower. Low pressure steam being available from the works main it was not necessary to provide exhaust via a turbine, and it was believed that a more compact and clean installation would be possible

Electric drivers to the pump house.



The pump house, showing instrument panel in background.

with the electric drive. At this early stage in the operation of the plant there is no reason to doubt that these conclusions were correct. The power consumption is between 45 and 50 units per hour and the cost *ca.* 0.9d. per gall. of benzole made.

Consideration was first given to the necessity for, and suitability of, flameproof equipment for this particular and unusual purpose.

After discussion with the Company's Consulting Electrical Engineer it was concluded that flameproof equipment was not appropriate for the following reasons:—

(i) It was not certain that flameproof electrical equipment could be closely associated with the benzole plant proper, and there was no guarantee that such construction would ensure complete safety at all times and under all conditions.

(ii) It was considered that face-to-face flanges are liable to damage and maltreatment so that the value of the cooling space may be vitiated and the flameproof effect nullified.

(iii) The high cost and delayed availability of flameproof gear.

It was therefore decided that totally enclosed fan cooled motors should be used, and that these should be isolated from the pumps and the remainder of the plant by installation in a gallery separated from the main pump room by a brick and glass partition as previously described. This motor room is liberally ventilated and is open to the external atmosphere.

All the motors are by Lancashire Dynamo and Crypto and the starting gear is of normal dust and weather proof construction but is not gas proofed and is not water proof.

High breaking capacity cartridge type fuse gear is used. This has been shown by the Electrical Research Association and the British Standards Institution to operate without flame or heat.

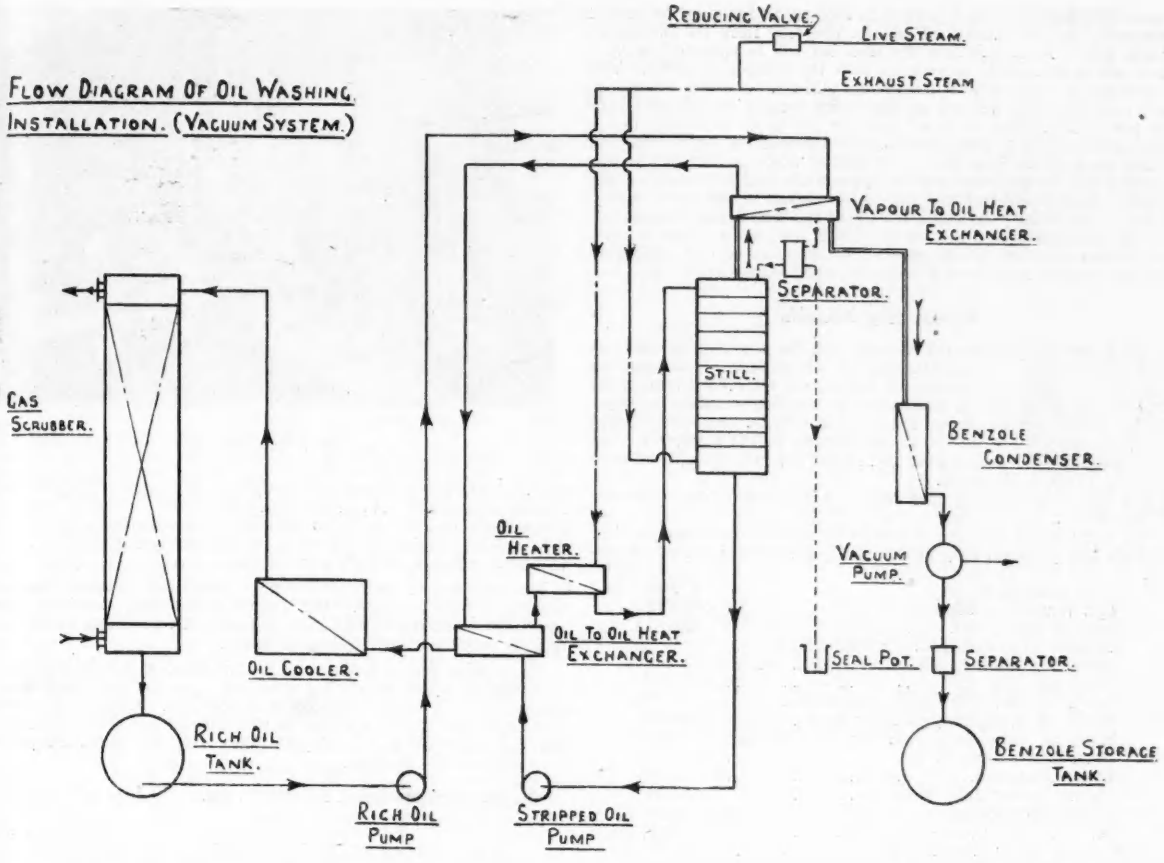
It is considered that the arrangement adopted is, from the electrical point of view, better in many ways that the indiscriminate installation of motors with pumps, even assuming that flameproof electrical gear is used. The final design certainly renders the plant both compact and accessible.

The whole of the electrical equipment is bonded together through a continuous heavy bonding bar which is earthed at each end of the installation to separate earth plates. Each pump shaft and belt drive is fitted with an earthed brush gear to take electrostatic and stray current from the pump shafts and belts to maintain them at zero potential.

Pumps, valves, and other apparatus, pipe lines and flanges are all connected to a continuous bonding and earthing system in parallel with the pipe lines. Each separate length of pipe is connected to the bonding bar at two points so that any potential developed at any point can pass to earth in either direction from either end of the individual pipe. There is virtually no current traversing the pipes longitudinally. The earth connexions are drilled and tapped at every point and the bond is connected to separate earth plates at each end.

The intention throughout has been to ensure that electrostatic, stray, or leakage current in the system shall pass to earth by the shortest possible route. Two good paths to earth are provided—first from the apparatus and secondly from the earth bar to the earth plates—to guard against the accidental removal of any earth connexion during repairs or maintenance. Moreover, with this arrangement, the earth system itself will not be interrupted even though some part of the plant or pipeline may be removed, and the possibility of a mechanical fault breaking the earth connexion is reduced to a minimum. It is further intended that particular supervision shall be given during maintenance and repair operations on the plant to ensure that the earth system remains continuous and effective.

There are no lighting circuits within the pump room, the artificial light being projected from the walls of the motor room through the glass partition. The possibility of an electrical fault endangering the plant is thereby eliminated. The lighting system is designed so



that there is not at any point more than 55 volts r.m.s. above earth potential.

A meter is installed on the main electric supply and sub-meters on each of the individual pump units.

Instrumentation.—The preliminary discussion of the layout of the plant included consideration of the possibility of eliminating operating labour. It was concluded that the fitting of adequate recording instruments together with automatic indication and audible alarm of abnormal conditions prevailing in certain critical functions would enable this to be achieved. It was also considered essential that the records should provide information which would enable accurate operating costs to be calculated.

As a result of collaboration by the Company and the Contractors with Messrs. Negretti & Zambra, Ltd., and Electroflo Meters Co., Ltd., a very complete instrument panel and remote alarm system has been devised.

The instruments provide the following records:—

(1) Oil circulation g.p.h.
(2) Steam consumption L.P. (lb./hr.).
(3) Steam consumption H.P. (lb./hr.).
(4a) Vacuum Hg still base.
(4b) Vacuum Hg inlet condenser.
(5a) Steam pressure L.P. main.
(5b) Steam pressure open to still.
(6a) Temperature oil to coolers.
(6b) Temperature oil from coolers.
(7a) Temperature oil to preheaters.
(7b) Temperature oil to still.
(8a) Temperature oil from still.
(8b) Temperature cooling water.
(9a) Temperature vapour inlet condenser.
(9b) Temperature vapour outlet condenser.

Review of these daily records enables any abnormal condition to be noted and rectified.

The instrument panel is situated in the motor room but may be observed through the glass partition from the pump room.

The alarms indicate (i) reduction of failure of oil to the scrubber; (ii) excessive fall of oil level in the benzolized oil tank, and (iii) loss of vacuum in the still. These instruments (supplied by Messrs. Negretti & Zambra, Ltd.) are also fitted on the main panel in the motor room, and the alarm of any one condition becoming abnormal is transmitted electrically to the works exhauster house and distribution control room. In this way it has been possible to eliminate continuous supervision which previously had been considered necessary in a plant of this type.

The oil flow alarm is operated by an orifice plate fitted in the debenzolized oil pipeline. A reduction in the flow causes a decrease in the differential pressure across the orifice which operates a mercury switch in a circuit controlling a Klaxon horn and a light behind a panel describing the particular fault.

The depth of oil in the benzolized oil tank operates on a submerged diaphragm and capillary system by which the pressure is transmitted to a mercury switch in the instrument. A fall in pressure on the diaphragm operates this switch in the second alarm circuit.

Similarly, a third mercury switch is held open by the vacuum within the still. Each of these alarms is complete with adjustable setting so that the operating point may be defined in each case.

The electric supply operating the instrument alarms is taken from a 24 volt battery which is trickle charged, and in the event of failure of this supply, current is automatically available from the mains to the remote alarm panels where " Battery Failed " is indicated.

Finally, the plant is automatically protected against fire. This equipment was supplied by the Pyrene Fire Extinguishing Company. A series of eight cylinders of carbon dioxide is situated in the motor room. Tension is maintained on a system of wires fitted in the pump room in which a number of fusible links are included. Fusion of these links by fire is arranged to release a series of weights which cause the diaphragms of the CO_2 cylinders to be pierced, thereby releasing the gas to a pipe system from which it is discharged at strategic points in the pump room.

In case the fusible links may fail to operate the system provision is made to release the gas from a point outside the building. Alarm and indication of the operation of the fire extinguishing equipment is also transmitted to the remote control panels.

Future Extension

The ultimate coal gas manufacturing capacity of the Garston Works is visualized as 20 million cu.ft. per day, and with this figure in mind an attempt has been made to allow for plant adaptable to potential requirements.

Provision is made for the installation of an additional scrubber identical with the one already installed. At present a scrubber of the

same diameter but 30 ft. high will be erected, and this will be used as necessary for the removal of naphthalene only from the carburetter water gas. At a later date this scrubber will be extended to 95 ft. and will then operate in parallel with the existing scrubber. This combination together with the present still and ancillary equipment will provide normal benzole recovery with vacuum distillation on the output of 20 million cu.ft. of coal gas per day. Assuming that a successful process is available which will enable the organic sulphur compounds to be removed at an earlier stage in the purification system, this arrangement will be appropriate and a benzole of low sulphur content will be produced. Alternatively, in the event of such a process not being practicable, the layout has been designed to provide for the installation of a further distillation unit, which, together with the second scrubber, would provide for the reduction of sulphur to the same extent as at present from the increased volume of gas.

Operating Results

The plant was put into commission with the minimum of difficulty and credit is due to the contractors on this account. The plant has remained in operation throughout the winter, the official request for coal conservation having been met by reducing recovery at other works, and by developing the use of oil in C.W.G. plant to an extent which reduced the overall coal requirement in the Company from an average of 42.5 during 1945 to 35 tons per million cu.ft. of total mixed gas (450 C.V.) made.

The following results of operation were recorded during the month of December:

The gas washed consists of a mixture of horizontal and vertical coal gas with producer gas, the C.V. being 417 B.Th.U. prior to washing.

Coal carbonized, tons	12,586
Gas washed, $1{,}000_2$ cu.ft.	235,558
Benzole made, gall.	46.455
Benzole recovered, gall. per ton coal	3.69
Benzole recovered, gall. per 10^4 cu.ft. gas	1.97
Wash oil used, gall.	1,971
Wash oil used, % benzole recovered	4.2
Wash oil circulation, gall. per hour	8,150
Wash oil circulation, gall. per 10^4 cu.ft. gas	258
Total steam used, 10^3 lb.	2,339
Water used, gall.	2,750
Electric power used, units	35,020
Oil to still temperature, °C.	94
Oil to scrubber temperature, °C.	19
Cooling water temperature, °C.	17
Vacuum, Hg, in still	21
S_2 content of gas, inlet grains/100 cu.ft.	31.6
S_2 content of gas, outlet grains/100 cu.ft.	12.3

The low C.V. of the gas entering the scrubber will be noted. This is due to the admixture of producer gas, and does not assist the washing efficiency.

The water consumption figure is abnormally low due to the temporary replacement of evaporation and physical losses by condensate from the low pressure steam line.

Gyroscopic determinations of the benzole content of the gas have been made as follows:

Benzole content, gall. per 10^4 cu.ft.—

Inlet	1.87
Outlet	0.08
Recovery efficiency %	95.7

Sulphur Removal

The plant was installed with the specific object of reducing the organic sulphur content of the gas. Tests show that the absorption of these compounds is 61.1% of the total, the outlet gas content being 12.3 grains. This is equivalent to 89.2% of the sulphur other than COS, which indicates that the calculated recovery has been achieved. The sulphur content of the washed gas is not, however, as low as had been hoped, although it was known at the conception of the installation that the COS content of the mixed gas was rather high —7 to 9 grains per 100 cu.ft.

Since that time the modification of gas making procedure has included the installation of a mechanical producer (Power Gas Corporation, Ltd.) and the volume of producer gas added to the coal gas has reached 25%.

Determination of the individual sulphur compounds in the various gases shows the following to be the distribution:

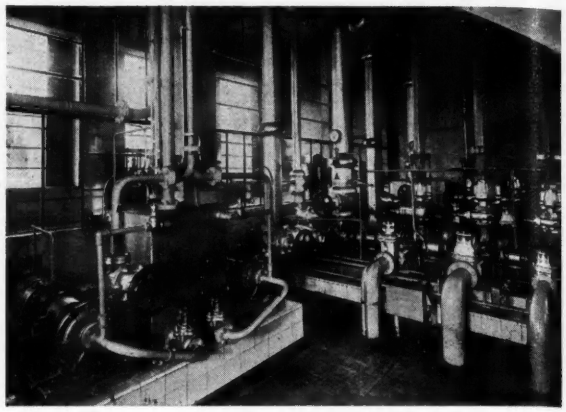
		Grains per 100 cu.ft. as S_2			
	C.V.	Mercap.	Thiophene	CS_2	COS
Horizontal C.G. unwashed	(557)	Nil	9.9	29.5	6.0
Horizontal C.G.* unwashed	(579)	2.6	10.3	22.5	7.4
Vertical C.G. unwashed	(434)	0.2	4.5	12.9	9.3
Vertical C.G.* unwashed	(425)	1.0	3.6	8.9	9.0
Horizontal C.G. and P.G. unwashed	(405)	0.3	6.9	20.9	10.2
Mixed H. and V.C.G. and P.G. after washing	(395)	Nil	0.2	2.2	9.9

While it has not been possible to determine the sulphur compounds separately in the producer gas these figures indicate that the COS is high. This has been noted previously* and is particularly unfortunate in view of the low C.V. of this gas. The COS content of producer gas seems to be of the order of 100 grains S_2 per therm compared with a figure of 18 grains for a normal vertical coal gas of 450 C.V. containing 8 grains S_2 as COS per 100 cu.ft.

The reduction of the sulphur content which was visualized has not, therefore, been realized. The total sulphur has, however, been materially reduced and the facility is available when more normal gas making procedures are again established.

The benzole recovery efficiency is maintained at a very high level. The plant has been operating consistently during four months and the operating costs are estimated to be very low. It seems, therefore, that experience during a further period will confirm the present view that the decision to install the plant was correct and that the expenditure will be fully justified.

* Gas Research Board Comm. No. GRB.17.1945.



The pump house.

Gas from Oil

Use of oil for gas making at the Liverpool Gas Company's Wavertree Works. Mr. W. S. Hubbard, Engineer, explains the process to (left to right) Mr. F. G. Shaw, Chairman, No. 10 Region Gas Engineering Advisory Board, and Mr. C. H. Leach, General Manager of the Liverpool Company.

Canadian Sales of manufactured gas by distributing companies during October totalled 1,981,300,000 cu.ft., an increase of 47,944,000 cu.ft. on a similar period during 1945. Of this amount 1,183,933,000 cu.ft. were spent for domestic purposes, other than house heating; 392,910,000 cu.ft. for industrial use; 326,559,000 cu.ft. for commercial use; 73,687,000 cu.ft. for house heating; and 4,211,000 cu.ft. for other uses. The sales figures represent sales by distributing companies to customers; amounts used by producers are not included.

The Gas Industry *vis à vis* the Coke Oven Industry

[From a Special Correspondent]

(*Continued from p. 367*)

The efficiency of gas production may be defined by the relationship

$$\frac{\text{Therms in gas} \times 100}{\text{Therms in coal} - \text{Therms in coke and breeze for sale} - \text{Therms in tar, \&c.}}$$

Or more simply by the relationship

$$\frac{\text{Therms of gas} \times 100}{\text{Therms of gas} + \text{Therms of producer fuel used} + \text{Therms wastage.}}$$

S. Pexton [10] has pointed out that thermal loss by wastage is small and fairly constant for similar coals and for different types of carbonizing plant and may be taken as 0.08 therm per therm of gas made. Thus, if the fuel consumption is also expressed per therm of gas made, the efficiency of gas production may be directly related to the fuel consumption per therm of gas made. The results quoted previously afford a means of comparing the relative efficiencies of gas production for different types of carbonizing plant.

It may be noted that coke ovens show in regard to efficiency of gas production a slight superiority over continuous vertical retorts, despite the fact that the latter interchange part of the sensible heat in gaseous and solid products with incoming coal and steam. These efficiencies, however, represent the economy with which the carbonizing plant is operated and take no account of the fuel expended in raising steam for all process requirements, such as coal and coke handling, for gas, tar, and liquor pumping, and for electrical generation.

When the fuel expended in raising steam for such purposes is included in the computation of the efficiency of gas production the efficiency for the works as a whole is obtained. Thus the generation of steam in waste heat boilers may so reduce the steam generation by coke or breeze fired boilers that the overall efficiency of gas production for works with a complement of waste heat boilers may be less than that of coke ovens without such means of raising steam except in the annular boilers on mechanical producers.

Gas Making Results

Typical gas making results of different types of carbonizing plant have been given. The common denominator of unit ton of coal carbonized may appear to make the gas yields from horizontal retort plant and from coke ovens compare unfavourably with those of vertical retort plants, but in the latter the output of gas from the coal is augmented by water gas generated from steam supplied to the retort.

An index of assessment has been developed by Pexton, the Hydrocarbon Enrichment Value (H.E.V.), which is a measure of the amount and calorific value of the hydrocarbons which enrich a gas over the blue water gas. It is of value in expressing the results of carbonization irrespective of the calorific value of the gas made, and it should be the aim of good carbonizing practice to maintain this at a maximum. The H.E.V. varies with different coals in the same plant, but with Durham run-of-mine coal (8% ash and moisture) the following average results are obtained:

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Intermittent vertical chambers ..	36
Continuous vertical retorts	35

Coke ovens stand on a par with horizontal retorts in producing gas of high H.E.V. Because a high degree of cracking has been obtained a slightly greater volume of dilution gas may be added to produce the lower calorific value gases obtained in vertical retorts, but a second plant (carburetted or blue water gas) may be required for this purpose.

Coal

In gas manufacture the aim is to produce the maximum thermal yield of gas, whereas in the manufacture of coke the object is to attain the highest possible yield of serviceable coke by fixing as much as possible of the carbon of the coal at the expense of the volatile products. Thus, strongly coking coals with a relatively high fixed carbon and a lower yield of volatile matter are preferably selected to produce metallurgical cokes. Such cokes are also influenced by the size of the coal carbonized, and on this account the techniques developed by the gas and coke oven industries have differed.

Machine charging of horizontal retorts makes it necessary that the coal does not contain lumps of too large a size, and for this reason run-of-mine coal is crushed to about 2 in. before being elevated to storage bunkers above the retort benches. It has been shown, however, by the Fuel Research Board (Technical Paper 26, 1930) that smalls below ¾ in. can produce a gas richer by 20 to 30 B.Th.U. per cubic foot than graded coals without there being any reduction in thermal yield. Trouble may be caused, though, in ascension pipes and tar mains because of the dust carried into them if use is made of dry smalls containing a percentage of fines below ⅛ in. To give a satisfactory coke the B.S.I. swelling index should be not less than 4.

[10] S. Pexton, J. Inst. Fuel, 1935.

Intermittent vertical retorts will carbonize any size and type of coal taken by horizontals, and because of its lower bulk density screened coal will give a lower yield per unit of plant than run-of-mine coal.

Modern designs of continuous vertical retorts will carbonize crushed run-of-mine coal with B.S.I. swelling indices up to 9, but care must be taken in the choice of coal so that there is no tendency for the slowly moving charge to " hang up." This type of retort is also responsive to coal size, screened coal giving a greater thermal output per unit of plant than run-of-mine coal, since the greater porosity of the charge permits quicker carbonization through internal heating by the uprising gases. Steam contact, steam reaction with coke, and the reactivity of the coke product are also improved with more porous charges, but where smalls can be incorporated with the lower swelling coals an improvement in calorific value can be obtained.

Coke ovens regularly carbonize small coal of less than ½ in., this being obtained either from colliery slack or by crushing run-of-mine coal. As the size of coke obtained and its hardness are increased progressively with decreasing size of coal, the coal is normally crushed to give 100% through ½ in. and 90% below ¼ in. Oversize coal is detrimental to the quality of the coke required for metallurgical purposes. In order that the carbonized charge may be readily pushed from the ovens, it is necessary that the B.S.I. swelling index is not less than 4. Certain coals, however, tend to set up dangerous swelling pressures in ovens, which may be mitigated by suitable blending with other coals.

A common feature of coke oven plants is the blending bunkers used for supplying the oven storage bunkers via crushing machines with a mixture of coals intimately blended. By suitable adjustments of the proportions of the coals supplied from different bunkers a reasonable uniformity in the properties of the coal carbonized can be preserved, thereby simplifying the operation of the ovens. Of greater importance, however, is the fact that uniformity in the properties of the coke made is also obtained.

Coke

The characteristics of the coke produced by the carbonization of coal are dependent on—

(*a*) The properties of the coal used;

(*b*) The type of carbonizing plant.

Apart from the factors of time and temperature.

Thus the free-burning qualities of coke are less satisfactory when it is produced from the higher rank gas-making coals with lower oxygen content, but the cokes can be improved by selection of the type of plant used. Since the higher rank gas coals give the best gaseous thermal yields, the selection of coal is a matter of compromise based on the relative values of the gas and coke obtainable. The proportion of extraneous ash in the coal used affects the strength of the coke, since washed coals containing little more than the inherent ash produce a higher percentage of the larger sizes of coke.

As far as the type of carbonizing plant is concerned, it has been found that heavily charged horizontal retorts produce a large coke, which, however, is not so dense as that made in other intermittent systems. It is fairly low in reactivity. With light charges the coke is smaller and softer, but more reactive. Continuous vertical retorts make a coke of a comparatively light and porous nature of high reactivity as far as high temperature carbonization is concerned. These favourable properties are mainly due to the nature of the process, the continuous movement in the retort tending to keep the coke lighter and the steaming normally practised reducing the thickness of the coke walls enclosing the pores. The cooling effect of the steam on the coke also avoids the more drastic quenching required in batch systems of carbonization, a factor which may also affect the properties of the coke.

The coke produced by intermittent vertical retorts or chambers is little different from that produced in horizontal retorts. Although the advantages of steaming are obtained, the superimposed pressure due to the weight of coal in the chamber counterbalances these beneficial effects. The nature of the process therefore tends to make the coke more akin to oven coke than that produced by any other system of carbonization.

Coke ovens are exceptional in the Gas Industry, but it is characteristic of them that they produce the largest, hardest, and densest coke of all systems of carbonization. These properties are desirable in coke used for metallurgical purposes and are partly due to the fine crushing to which the coal is subjected before carbonization, but they are also due to the pressure caused by the weight of superimposed coal. Because of this weight the coke from the bottom 2 ft. of an oven is much more dense. The reactivity of oven coke is also lower than that of any other type. Because of these properties the coke normally produced in coke ovens is generally unsuitable for use in domestic appliances, but experiments have been made with a view to producing domestic cokes in such plant. The results of full-scale oven tests for

the production of coke suitable for use in domestic grates have been quoted by J. Roberts.[11] They indicate that a mixture of coking and non-coking coals can produce such a coke when there is a reduction of 25% in the normal coking time of 14 hours in the ovens, which were of 16 in. mean width. The volative matter content of the coke was between 3 and 4% by weight.

(11) J. Roberts, Bull. J. Inst. Fuel, 1946 (June), p. 219.

Suggestions have been made at various times that the production of free-burning coke can also be brought about by carbonizing gas coals in narrow ovens at a high rate or by using lower rank gas coals. Where gas making is the prime object of carbonization, the high capital outlay required for an installation of coke ovens would, however, make the experiment somewhat hazardous.

(To be continued)

Purging of Gas Plant and Holders

FOLLOWING is a report of the discussion on the Paper on "The Purging of Gas Plant and Holders" which Mr. L. Silver (Gas Light and Coke Company) presented to the Southern Association of Gas Engineers and Managers (Eastern District) on Jan. 28. The paper was pnblished in the "Journal" of Feb. 5 and 12 (pp. 317 and 374).

The **Chairman** (Mr. J. H. Dyde) said he felt it was a little surprising, in view of the fact that the Gas Industry was well over 100 years old, that it was not until the 1930's that they seriously took up the question of purging gas plant. A merciful Providence must have looked after the interests of gas undertakings in the 70 or more years before safety precautions were taken. The Author had drawn particular attention to the peculiar position with regard to hydrogen and the very wide limits of explosibility of that particular constituent. It was interesting to note that the Air Ministry, in regard to their hydrogen plants, were fully alive to the position, and they did, of course, thoroughly purge the whole of their plant, producing waste gas, largely CO_2 and nitrogen with a very small excess of oxygen for the purpose. They admired the clever and ingenious graphical device for measuring the limits of explosibility, and also the application of the Le Chatelier principle for the determination of those limits with quite complex mixtures of gases such as those encountered in town gas, containing a certain amount of inerts.

He thought one of the most important and practical outcomes of this investigation was the use that had been made of the principle of diffusion, in being able to reduce the amount of added CO_2 or inert gas, and in consequence the cost of the operation. It was largely because of that diffusion effect that when Mr. Silver quoted the volume of inert gas required he showed an improvement compared with the figures originally quoted by Mr. Birks in the Paper to which reference had been made. When displacing air by inert gas before bringing a holder into operation, the figure given in Mr. Birks' Paper for the inert gas was from three to three and a half times the volume of air to be displaced, whereas in this Paper it was shown that with the displacement of air by town gas only three quarters to one volume of CO_2 was required, or from one to two volumes of the products of combustion.

Another interesting feature was the application of the use of CO_2 in cylinders, which saved a tremendous amount of time and was much more readily operated, and which, probably in the case of the smaller undertakings, would provide apparatus sufficient to do any particular job where required. Mr. Silver, however, noted that although some gas-works might have permanent pipe lines from their retort house or boiler flues for such purposes as purging purifiers, the source of waste gas most commonly employed on gas-works and holder stations was the purging machine. It would be interesting to know if any members of the Association had any permanent lines connecting their waste gas flues to the purifiers or other apparatus for purging. He had been on many gas-works but in no case had he seen such permanent connexions, and if anyone had employed them it would be interesting to have their experience. It would be generally agreed that the code of good practice which formed the final section of the Paper was clearly and concisely set out, and it would be consulted by all who had to undertake purging operations. In that code of practice one of the most important points brought out was that the simplest way of determining CO_2 content, which was really the controlling feature of the purging process, was by the Orsat apparatus which they all knew so well.

Historical Introduction

Dr. **R. Lessing**, in a written contribution read by the Secretary, wrote: To supplement the historical introduction to the subject of the purging of gasholders, the following letter might be of interest, which I addressed to the Editor of the "Journal of Gas Lighting" (now "Gas Journal") in 1909. The letter, which appeared in the "Journal" of Dec. 21, 1909, was prompted by the explosion of a large holder in Hamburg:

"Seeing that the testing of units of gas plant by air pressure is not an uncommon—if not the usual—practice, I venture to make a suggestion, to obviate or lessen the risks attached to such a procedure. Could it not be made a rule—possibly to be embodied in factory regulations—to carry out these tests with a more or less inert gas, such as ordinary combustion gases? All that should be required would be to connect the suction of the blower or compressor employed to a pipe coming from a flue or chimney; and a small coke scrubber for cooling and cleaning, and, if necessary, a limestone scrubber for removing sulphur dioxide, might be advantageously interposed. If, for instance, purifier boxes were blown out with this inert gas before removing the lids, the not infrequent explosions by spontaneous ignition could in most cases be avoided. This would greatly reduce the number of casualties debited to the Gas Industry—to the chagrin of those who are only too ready to make use of accidents of this kind for the purpose of competitive propaganda."

It appears that it took more than 20 years before this suggestion was acted upon, and then in America. This throws a peculiar sidelight on the progress in technical development, but at any rate it is gratifying to know that at long last Mr. Silver, with the thoroughness one expects from him, has provided the scientific fundamentals by which the process can be carried out efficiently.

Mr. W. H. White (Clerk of Works, Gas Light and Coke Company) said that during the past three years his Company had found it necessary for their purging requirements to use over 11 million cu.ft. of inert gas. Of that quantity 1% was obtained from CO_2 from cylinders, 52% by burning town gas, and 47% from oil. The site-generated inert gas was obtained by using a portable Harrison purging machine of approximately 10,000 cu.ft. per hour capacity. The average analysis of inert gas from town gas was 10.8% CO_2 and 0.5% O_2, specific gravity 1.03; and from oil it was 14.6% CO_2 and 0.4% O_2, specific gravity 1.05.

Using the Harrison machine it had not been found difficult to maintain a steady quality throughout the operations, but of the two methods the use of oil was to be preferred because of the higher CO_2 value and the constant source of supply of oil, whereas with gas, unless an adequate supply was available, greater fluctuation in inert gas quality was obtained. The temperature of the issuing inert gas from the machine was approximately 140° Fahr., and the temperature of the cooling water discharged was approximately 160° Fahr. Water-sealed holders, waterless holders, and gas-works plant, including purifiers, washers, mains, &c., had been purged. Three complete gas-works were included in their programme, one of which was a 16 million cu.ft. per day works. The Author had stated that purging equipment should be large enough to complete the purging operation in one day. Was that really essential? Take the case of horizontal displacement, as in waterless holders, where it was stated that 50% more inert gas was required than with the upward displacement method used in water-sealed holders, which required two volumes of inert gas from gas to air; then three volumes were required for waterless holders for the gas to air purge.

The following actual examples accentuated that point. With a large waterless holder of 105,000 cu.ft. landed capacity, requiring 315,000 cu.ft. of inert gas a machine capacity of approximately 45,000 cu.ft. per hour would be required. The weight and size of such a machine, some seven to eight tons, would make it unwieldy for handling, particularly on soft ground, apart from the difficulty in obtaining some 5,000 to 6,000 gall. per hour of cooling water. With a large water-sealed holder with a landed capacity of 460,000 cu.ft., on the two volume basis, 920,000 cu.ft. of inert gas was required, and in that case over 130,000 cu.ft. of inert gas was required per hour.

In their particular case an average size water-sealed holder had a landed capacity of 76,000 cu.ft., requiring 152,000 cu.ft. of inert gas for the gas to air purge, requiring a machine capacity of approximately 20,000 cu.ft. per hour. Surely it was better to use a machine size the weight and manoeuvrability of which was the most suitable for all conditions, and adopt a purging technique in accordance with its capacity.

Purging of Waterless Holders

With regard to the purging of waterless holders from gas to air, where the landed volume was above the capacity of the purging plant to complete in one day, he had found that a satisfactory method was to vent the underside of the piston to the commencement of a falling gauge and then open up the inert gas supply, close the vent to the piston, then inflate well above the estimated contraction margin before shutting down for the night; on the following day, vent to atmosphere and repeat as before until the required CO_2 content

was obtained. In the case of air to gas purge, this method was not necessary. The piston was landed, the piston vent opened to atmosphere, inert gas was admitted and the vent was closed when a satisfactory CO_2 value was obtained. Using this method, a large vent could be used through one of the side manholes. In both cases the piston was finally inflated well above the contraction margin until the work on gas connexions was completed. The purging machine was on no account disconnected until all the other operations were completed. A similar technique was employed with water-sealed holders.

He noted that Mr. Silver advocated that in connexion with inert gas to air, or gas, the downward displacement method should be used. Whereas the inert gas to air method was simple, surely the velocity of gas discharge through the inlet main would be comparable to admitting gas through the top of the crown, and from the practicable point of view very much simpler. A flexible hose up to 150 ft. long for the gas supply brought its own hazards. With filmed holders, Mr. Silver had recommended that the oil film or coating emulsion should be removed before purging operations were commenced. Such removal was not easy, particularly with large holders. He had tried several methods, and the most successful one was carried out by purging the holder first, *i.e.*, from gas to air; on completion with inert gas, straightway air blowing and venting, then removing either manhole covers or plates at four points on the crown, placing a high capacity pump suction (some 30,000-40,000 g.p.h.) just below the surface of the oil to maintain a vortex around the suction inlet, and discharging the oil and water to the outer annulus, using separating dams, and then removing the separated oil.

Floating Emulsions

In connexion with floating emulsions usually to be found in carburetted water gas relief holders, one particular example might be of interest. It was necessary to purge a particular holder which had a tar film approximately 6 in. deep, having a low flash point. The holder was purged with inert gas and the tar was then extracted, using a cranked suction through the side sheeting. The extraction took 15 days and the actual tar oil removed was over 50% of that estimated by dipping. The difference was ultimately found to be due to the fact that the emulsion kept rising and falling, some of which remained on the surface and the remainder sinking again below the top water level. It was later established that there was a 2 ft. thick layer of emulsion about 2 ft. below the water level, which varied in submergence according to change of temperature. In view of the uncertainty of the operation, he would like to know if Mr. Silver would still advocate removal before purging.

Some guidance would be welcomed in connexion with waterless holders, where the inner zone of dehydrated tar and the outer dam containing sealing tar was benzole-saturated. Similar conditions prevailed as with oil filmed holders, and the only practical way in which he could see the job could be done was, after inert gas purging, to follow on with air blowing. Regarding the Author's remarks on not purging during a thunderstorm, surely the only way was to carry on and complete the job. Meteorological reports being what they were, one might wait for days and so lose valuable time.

Concerning instruments and test apparatus, a really reliable, portable, and robust CO_2 recorder would be a great boon, and he would like to know whether such an apparatus existed. In rough weather sampling and testing in the vicinity of a holder was something to be experienced, and if instrument designers knew what conditions were like, they would probably get something worth while. He would in addition advocate a simple robust flash test apparatus, and would like Mr. Silver's views on that point. Finally he would like to ask the Author what was the difference in the upper and lower limits of dry gas compared with gas saturated with moisture. One last point was that Mr. Silver mentioned the question of purging grips. The method they had found most satisfactory was to use a small capacity petrol driven vacuum pump. They exhausted the grips and fed back from the purging machine, and were able to purge the grips to air in a rapid and effective manner.

Waste Gas Services

Mr. **L. Muir Wilson** (South Metropolitan Gas Company) congratulated and thanked Mr. Silver for a most interesting and instructive Paper. The question of purging and preventing the formation of poisonous or explosive mixtures was one which always seemed to be with them. It was a most uncomfortable thing to feel that one had an explosive mixture on the works at any time. Explosive mixtures were easily enough made, and it seemed that the Devil very often found ingenious and unexpected ways of igniting them, so they were something that should be avoided at all costs. In his Company they had given a lot of thought and attention to the matter over many years. They did not much care for purging machines and did not use them. They considered they were cumbersome and they needed a good deal of water because they evolved so much heat, and if coal gas was used in them only a relatively small amount of useful waste gas was produced for one's money. Coke was a more cumbersome fuel than coal gas. Oil, which they had not considered at all, seemed more attractive. He thought Mr. Silver's description of the use of CO_2 in cylinders was an excellent idea, if not too costly.

They had been asked by the Chairman whether any undertakings had waste gas services installed at any of their works. In the South Metropolitan Gas Company they had had a complete service installed both for the purifiers and the rest of the plant and holders at their Rotherhithe works since about 1928. At the Old Kent Road works, since about 1924, they had had a similar service installed complete with waste gasholder. This had been extended to purge out the gasholders. At their East Greenwich works they had had waste gas laid on a pipe line round the retort houses for perhaps 20 years, but unfortunately they had been unable to find enough money to extend it to the purifiers, on account of the expense on such a large site. At their Vauxhall works they had had waste gas installed for the purging of purifier boxes since just before the war. Unfortunately they had had trouble with the fans and they had not managed to get them replaced because of a general shortage of everything, so they could not make use of that installation at present. One of the great trials of waste gas was that with such a highly corrosive substance the installation, particularly fans, corroded away very rapidly. On gasholder stations where they had no waste gas they displaced the gas in the holder crown with air, and the air was blown into a 10 in. pipe passing through the crown; the pipe finished up just above water level and the gas was pushed out through a valve at the top of the crown and up through a 70 ft. canvas sheet of 10 in. diameter. The canvas sheet had a wire cable through it which was earthed to the holder and to the guide frames, while it was well bended to the metal ring at the top of the canvas sheet. They did not carry out that operation in thunderstorms, and as far as he could see, although an explosive mixture was formed, there was no chance of it becoming ignited because they took the most rigorous precautions. He felt rather as if one were sitting on top of a volcano, and it would be much nicer if an explosive mixture was never formed.

They never put any faith in flame arresters when purging. He had known gauzes not much better than chicken netting used for that purpose which were quite useless, and even the finest gauzes were not safe because once an aerated flame came in contact with them it was not very long before they became heated through. There was, on the other hand, a type of flame arrester made of rolled up metal strip, the metal strip being like very fine corrugated cardboard. This was effective but very soon became stopped up with dirt and it was far better not to have to rely on things of that sort.

Blowing of Producer Gas Mains

He found Mr. Silver's triangular charts most interesting and informative. Some years ago, probably in the 1920's, they constructed a similar chart for the purpose and found it very useful, but Mr. Silver's charts were a great advance on anything they had ever produced. When they "blew in" producer gas mains carrying hot producer gas they found the safest procedure was to build the producer fire up to within about a foot of the top step and draw the mixture of waste gas and air from the producer through the producer mains to a suitable offtake such as a stack. When they were ready for gassing up they filled the fire right up with coke and put the blast full on. The products going through the main were analyzed for CO_2 at frequent regular intervals. A parabolic curve could then be plotted showing that the CO_2 rose to the theoretical maximum and then gave place gradually to CO. Consequently the air which was in the pipe was separated from the producer gas by waste gas. This simple automatic change-over could be carried out in about 15 minutes if one blew the fire really hard.

When purging from producer gas to air it was only necessary to let the producer fire burn itself out, and then at the end of the time, when hot oxygen began to appear in the products much of the free carbon in the mains would be safely destroyed. Otherwise this material was capable of propagating a dust explosion which was not made less likely by the presence of elemental sulphur. A certain amount of CO might be absorbed in the sooty carbon. This might be given off days later and could be a source of danger to men engaged on cleaning out the stuff which ought to have been burned away. He was of the opinion that when purging coal gas mains which had no awkward offtakes, if the job was done quickly there was very little mixing of coal gas and air. He said this because many years ago, when he used to blow mains out quite regularly, he used to put a whistle on the far end of the main, and the change of note in the whistle when air changed to gas or *vice versa* was absolutely clear cut. This saved a great amount of sampling; only one sample needed to be taken for test and that after the whistle note had changed.

Lastly, it might interest members to know that barrage balloons tended to become filled with an explosive mixture due to the outward diffusion of hydrogen and the inward diffusion of air. In order to keep them safe during the war, the South Metropolitan Company investigated the problem and supplied a very easily operable and convenient testing apparatus. This, they found, with small modifications, could be of great use to them on their works.

Mr. **J. Sharp Smith** (Gas Light and Coke Company) asked whether Mr. Silver could tell them anything about the initiation of explosiveness

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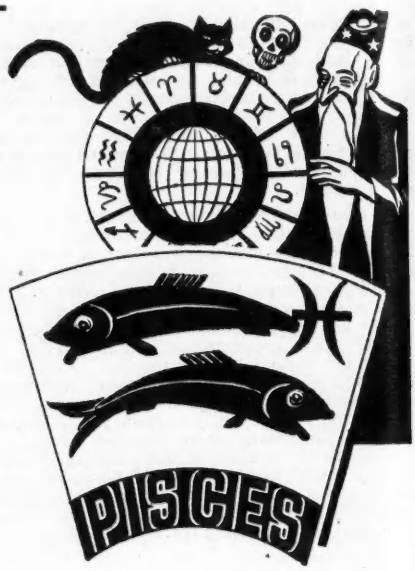

FEBRUARY 21 — MARCH 20. PISCES — THE FISHES

The Luminaries rising in the scene of Aquarius, with Mars and Jupiter in opposition and high tide at Wigan 1 hr. 58 min., a.m. all suggest gratifying prospects for you. Well, look a bit pleased, can't you? Pull onion tops and prick out cabbages now, also beware of a tall dark stranger. About the 24th your in-laws will cause trouble but when did they ever cause anything else? A political reaction in the Inner Hebrides will cause iron and steel shares to slump on the New York Stock Exchange. Wind will be N.N.W., backing and veering and fooling about all over the place.

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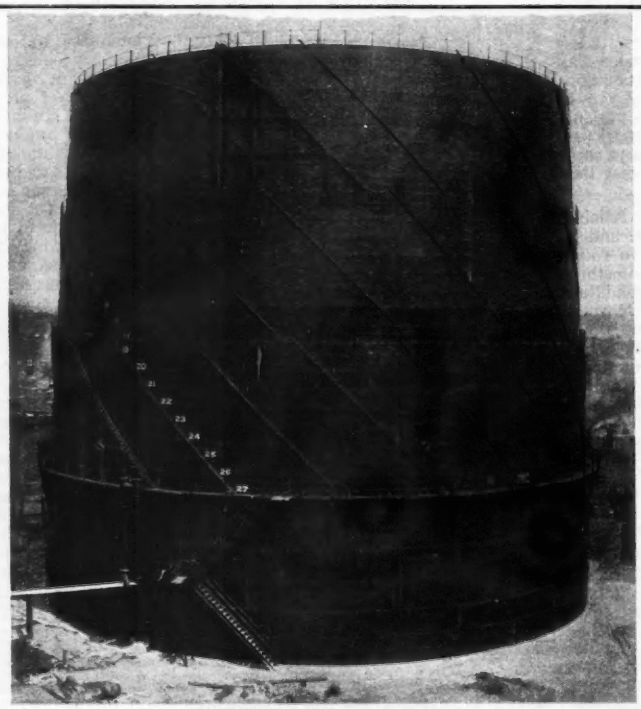

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in electrically charged vessels, particularly of the water gas relief type, by the iron sulphide which might form in them.

The Author's Reply

Mr. **Silver,** in replying to the discussion, agreed with the Chairman that it was very fortunate that so few mishaps occurred in the long period before purging was thought about. It was also providential that purging was so extensively developed in the 1930's, because a good many people were thinking about it and learning something about it just in time to make themselves very useful when the need for it became very urgent. A tremendous amount of rapid purging had to be carried out in 1939 and 1940 to put out of action a lot of holders which might have been very dangerous in view of the circumstances which then prevailed. Their initial experience of the use of liquid CO_2 for that purpose was obtained at that time, when the question of cost did not arise, but he did not think it had been used to the same extent since then. It was necessary at that time to do large jobs in a very short space of time. In his written contribution Dr. Lessing had been able to show that he had been a pioneer in many of the modern developments, and in fact in 1909 he was before his time. It was a very wise suggestion that he made in 1909 and it was a pity he did not operate it.

He was very grateful for Mr. White's contribution. He had given them the benefit of a very wide experience, and he agreed that the suggestions he had made in his Paper as to desirable practice in purging might well be modified in the light of the experience of people like Mr. White, because he knew so much on the practical side. The question of the removal of hydrocarbon oils and emulsions was extremely difficult. It was a counsel of perfection and it was suggested in the American code that it should be done. He agreed that the method Mr. White had described was a sound and practical one. When a holder having such a deposit in it was left open for some considerable time great care should be taken that it did not go into the holder again. With regard to CO_2 recorders, they had not done much with them, but there were a number on the market which were worthy of investigation, and he thought it was something they all needed. Analysis of the gas on the top of the holder on a cold wintry day was extremely unpleasant and arduous.

He could not give the difference in the upper and lower limits of dry gas compared with normal moisture-saturated gas, but he did not think there would be an appreciable difference in the percentage of water vapour. He thanked Mr. Muir Wilson for his remarks and was in full agreement with him when he referred to the small degree of mixing that occurred when displacing air in a main. For that reason it had sometimes been found desirable to drop a little plug of inert gas into the main and follow it up with gas. He agreed with what Mr. Wilson had said with regard to flame arresters. Too much reliance was not to be placed on them if the flame was on for an appreciable time. In reply to Mr. Sharp Smith, he knew very little about the initiation of explosion by iron sulphide deposits, but he thought it was highly probable that some of the unexplained explosions that had occurred had been due to some such cause.

South Eastern Machine

Mr. **J. W. Townsend** (Tunbridge Wells), in proposing a vote of thanks to Mr. Silver, said his Company had to operate a Harrison purging machine for use throughout the South Eastern Region. It was bought by all the undertakings in the Region in 1943, when it was thought that enemy action would be directed mainly against that part of the country and a lot of rapid purging might be required anywhere in the Region. There was no code of practice so far as they were concerned. They applied to the Gas Light and Coke Company for some assistance, but they were too busy. They therefore had to apply themselves to learning how to operate the machine, and they succeeded eventually. Mr. White's remarks had been particularly interesting because his experience with the Gas Light and Coke Company's 10,000 cu.ft. per hour machine was very similar to theirs. Normally they preferred to use gas oil for producing the inert gas. He was afraid they had never attempted to purge the grips of the holder, and they would therefore now have to set to work to obtain a vacuum pump for the purpose.

Mr. **C. A. Deas** (Tottenham), in seconding the vote of thanks, said he thought that on some jobs steam was quite a useful medium. The Author had not mentioned the large quantity of cooling water required for the purging machine, a matter which might be very difficult for some. It was simple with a river or pond near the works, but not otherwise. In many cases the CO_2 cylinders were undoubtedly the best proposition. At Tottenham they had used the system quite successfully. The Paper had drawn attention again to the question of the safe operation of plant. There was no doubt that many of them took chances, but there was a risk about many of the jobs they did, and he thought Mr. Silver had done a very good job in bringing that matter again to their attention.

Mr. **Silver** briefly acknowledged the vote of thanks.

A Documentary Film, entitled " Iron and Steel," has been produced by the British Iron and Steel Federation. Intended for presentation to schools, colleges, and universities as a stimulation for the recruitment of budding metallurgists and engineers, this 30-minute film traces the historic development of steelmaking and explains the technical processes involved.

Best Use of Coal

In the course of a letter published in a recent issue of the *Manchester Guardian* a correspondent wrote: " For many years it has amazed me that the people of the country should countenance such wastage of national wealth by burning coal in open grates and in industrial undertakings. There are very few chemicals which are not produced from coal, and when it is realized how much potential wealth goes up the chimney any person who has the desire that Britain should maintain her position as a leading power cannot help but demand that the maximum possible value be derived from coal."

In a subsequent issue Mr. Charles Cooper, of Messrs. W. C. Holmes & Co., Ltd., discussed the problem in the following terms :

" As your correspondent indicates, claims for the efficiency of power generation will have to be regarded from an absolute standard, not from a relative one, and the possibilities of increasing the overall efficiency of power generation on present lines are quite small. If the responsible authorities had had any regard to this question of overall efficiency they would have found reason to study the present status of the Gas Industry, which has survived the propaganda in favour of electrical generation, the restrictive legislation, and discriminatory national and local regulations, and now is thermally and technically working on a standard of efficiency which is very little appreciated.

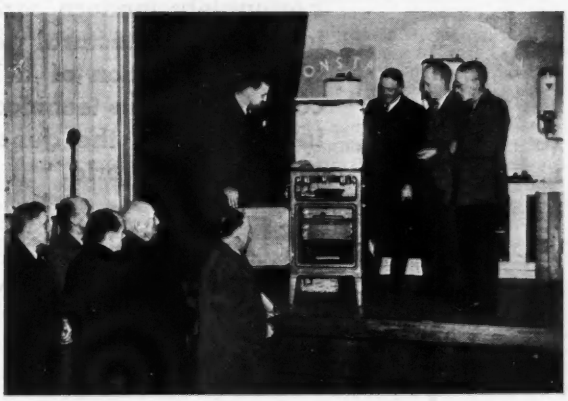
" It should be realized that the ' super power station ' has a thermal efficiency not much higher than that of the better domestic fire, and is moreover considerably more vulnerable. It has, for some queer reason, been fashionable to waste coal in both directions and to advertise the results of doing so.

" The capital that it is proposed to expend in the extension of super power stations would, in fact, be much better devoted to the general development of the carbonization of coal. Our closely-built industrial areas justify the promotion of medium pressure gas distribuion, given a calorific value standard being imposed over wide areas, over-riding the local preferences in favour of higher or lower calorific values. I have no doubt that your correspondent is aware that by no means all coals are suitable for processing, but the range which the coking industries can handle is much wider than is generally supposed, and the generation of power by the combustion of fuel should be carried out entirely by burning those which are rejected for such processing, and by using the residual products of processing, such as coke breeze.

" Unfortunately there is at the present time a serious bottle-neck in the development of carbonization, either in gas retorts or in coke ovens, and that is the extreme shortage of refractory bricks. British constructors are going abroad for supplies of such bricks at the present time, and the German production is suspended, largely as a result of the autonomy of the zones in Germany.

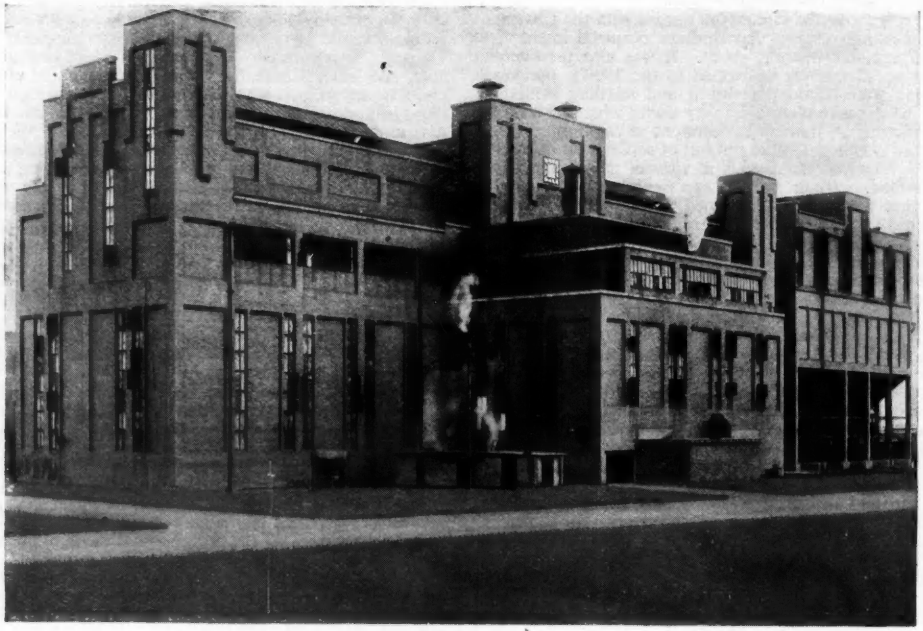
" The nationalization of the coal, electrical, and gas industries might, of course, make possible a consistent development such as the above, capable of saving, perhaps, 10% of the total coal output of the country, but there is no sign that there are any such intentions."

Men's Cookery Class



Mr. Hill, Examiner to the City of London Guilds in Catering, instructing on the use of the gas cooker at a Men's Cookery Class held in the Little Theatre of the Liverpool Gas Company.

Trade Statistics for October, 1946, just issued by the Department of Industry and Commerce in Eire show imports of 30,685 tons of gas coal, valued at £94,065, as against 22,399 tons, valued at £66,717 in October, 1945. This brings the total of these imports for the first ten months of 1946 to 225,262 tons, valued at £662,765, as against 169,489 tons, valued at £476,275 in October, 1945.



GLOVER-WEST

Vertical Retorts

at MARTON, BLACKPOOL

"Fortunately modern carbonising plant and modern ideas of architectural design both lend themselves to the production of a building which is at once convenient to its technical purpose and finds favour in the eye of the general public and that of the architectural world."

COMMUNICATION No. 230—PROCEEDINGS OF THE INSTITUTION OF GAS ENGINEERS 1939–40, p. 455

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Telegrams: Stoker, Manchester.

London Office: Columbia House, Aldwych, W.C.2
Telephone: Holborn 4108-9.
Telegrams: WESGASCO, ESTRAND.

COMPANY MEETINGS

Sheffield and District Gas Company

Lieutenant-Colonel Sir HENRY STEPHENSON, Bart., D.S.O., LL.D., J.P., the Chairman, presided at the 147th Ordinary General Meeting of the Sheffield and District Gas Company, held at the Company's Offices, Commercial Street, Sheffield, on Mar. 10.

The CHAIRMAN, in moving the adoption of the Report and Accounts, said: It is with very great regret that I have to refer to the death of the Deputy Chairman, Mr. Robert Greaves Blake. Mr. Blake was elected to the Board in April, 1910. His father, the late Major William Greaves Blake, was formerly a Director of the Company for many years. Mr. Robert Blake was a most useful member of our Board and very assiduous in his attention to the interests of your Company. Added to his excellent business qualifications he had a genial personality which won all hearts. His death is a loss which we can ill afford and which I am sure we all greatly deplore. Mr. Blake was one of the Directors retiring at this time by rotation and in compliance with our statutory requirements I as next in the order of rotation now retire in his stead.

Position of the Industry

The Directors' Report and Accounts for the year ended Dec. 31, 1946, have been in your hands for some time and I presume you will as usual desire to take them as read. Before, however, dealing with the Accounts, I think I ought to make a few observations on the general position of the Gas Industry, paralyzed as it has been by the lack of those facilities which would tend to make it more progressive and prosperous and threatened with nationalization which frustrates our scheme for re-organization.

No mention of the proposed nationalization of the Gas Industry was made in the King's Speech last November, but Ministerial utterances leave no doubt of the intention.

Speaking of your undertaking, we have had to contend during the whole of the year under review not only with a continuous shortage of coal but with much bad quality coal. This has prevented us from adequately fulfilling our obligations to our regular consumers, still less extending supplies to meet new requirements. Since the present year opened we have experienced the catastrophic breakdown in supplies of both coal and electricity.

It should have been obvious to the Government that if the consumption of coal exceeded production the small existing stocks must soon be exhausted and a crisis was bound to occur sooner or later. The weather precipitated the crisis but did not cause it.

If the Government would devote a little more attention to present-day needs and a little less to long term planning of a controversial character it appears to me the country would be in a much happier position than it is. So far as your undertaking is concerned we shall continue to do our best to overcome the difficulties which beset us.

We do not agree that nationalization is the best cure for our ills as we cannot see that it will benefit the Gas Industry or the consumers of gas. At the same time I should like to take this opportunity of stating that our relations with the Ministry of Fuel and Power are of the most friendly description and we are grateful to its officials for their help and advice.

Natural Integration

We have our own plans to meet the situation and all we desire from the Government is their assistance to enable the Industry by a natural process of integration to form larger units, though not necessarily identical with those envisaged in the Heyworth Report, some of which would appear to be unworkable.

As an instance I may mention the one stretching from Filey in the North East to Derby and Nottingham in the South and including within its boundaries both Leeds and Sheffield. As the Sheffield and District Gas Company is by far the largest Statutory Gas Company undertaking not only in this area but also in the whole country, excluding London, it is perhaps not unreasonable to expect that the Ministry of Fuel and Power would sanction no such scheme without specially consulting us and obtaining our views.

The best thing in the Heyworth Report is the statement that the Gas Industry is "efficient," which, coupled with Mr. Morrison's statement that "efficient" industries would not be nationalized, should afford us some protection.

Turning now to the accounts, you will see from the statement of Share and Loan Capital that our issued Capital has varied by the re-purchase of £100 5½% Perpetual Debenture stock. The next account sets out the Company's expenditure on fixed assets and this, as was to be expected after so many years of restriction, shows a large increase. The Capital expenditure on the Fargate showroom site about which I told you last year has now been included.

This showroom will not only replace the somewhat inadequate one which we had formerly in High Street, but will incorporate many facilities, including rooms for lectures and demonstrations, which at present are sadly lacking. At present we have no adequate showroom. Every effort is being made to secure the necessary building permit.

Your Directors have found it necessary, in order to accommodate newly-appointed senior officials, to sanction the purchase of suitable houses. This is a policy which is now being adopted by many leading industries throughout the country. There is also included in this account additional electrical plant, anti-freeze equipment, conveyors, and a new benzole plant to replace the old one which was worn out.

New Mains and Meters

The new mains and new meters are items which indicate the effort which your Company is making to wipe out the arrears of the past six or seven years.

After making due provision for the Depreciation Fund, the Redemption of the Gas Grid and the Depreciation of Meters and Cooking Stoves, you will see that we have overspent capital by £6,145.

In the Revenue Account there are comparative figures for 1945. The figures for coal illustrate the necessity for carbonizing more coal owing to the indifferent quality of so much of it. The quantity of coke oven gas received has fallen compared with 1945, but the cost has increased in total—owing to advances in price under our Act.

In this account the constantly increasing costs of wages, salaries, materials and all overheads are very noticeable, but these are not peculiar to your undertaking. The large increase in the item of "Service to Consumers" is, however, an indication that despite the rising costs we are endeavouring more and more to see that the consumer is properly and adequately served.

With regard to the Profit and Loss Account, we have not yet received final information regarding our liability for War Damage Contributions but a provision is made which we think will be adequate on the basis of the information available.

The item of Taxation is much higher than last year because of the sequence of rising profits which we have enjoyed in the past few years. Reserve Fund, Special Purposes Fund, and Benefit Fund Accounts will, I think, be self-explanatory.

In the Balance Sheet you will observe particulars of our Officers' Superannuation Fund. In this connexion I am sure it will interest you to learn that in future women will be allowed to become contributors and beneficiaries on similar terms to men.

You will notice from the report that your Board propose, subject to your passing the necessary resolution, to pay a final dividend to Dec. 31, 1946, at the rate of 6½% per annum, less income tax, which I trust you will agree is satisfactory.

For many months past we have been receiving reduced supplies of coke oven gas owing to shortage of coal at the coke ovens and we in turn have had to impose a 15% cut in the quantity of gas supplied to our industrial consumers.

Perhaps I may take this opportunity of expressing our gratitude to these consumers for their whole-hearted co-operation with us in conserving gas by its economical use.

Price of Gas

Owing to increased costs, your Directors, with the approval of the Ministry of Fuel and Power, were reluctantly obliged to advance the price of gas by three-farthings per therm to all classes of consumers as from the commencement of the September quarter.

In addition, the price of gas supplied to industrial consumers has been increased by an amount equal to the extra price the Company has to pay for coke oven gas supplied by the Grid Company under the terms of the Gas Grid Agreement.

Referring to the distribution side of your undertaking, there has been a very considerable increase in the amount of work carried out and as you will have gathered a start has been made on the task of dealing with much of the work that had to be deferred during the war years.

Consequent upon the Government's housing policy the greater part of the work of the Street Mains Department has been in the laying of mains and services to supply the new housing estates in all areas. Approximately 14 miles of mains were laid during the year while the roads were being made on the Parson Cross Estate and these mains will serve many of the houses to be erected on that estate in the coming year. A number of pre-fabricated bungalows have been supplied with gas and an increasing number of permanent houses are now reaching completion.

The past year has seen a recommencement of the erection of houses by private enterprise and a good number of these houses also have been connected to the Company's mains, which in many cases have been extended to cover the whole of the sites concerned.

Short lengths of mains have been laid in various parts of the City as well as in outside areas to improve the gas supply, but this has been limited by the scarcity of labour and materials.

In all, some 19 miles of new and replacement mains have been laid during the year and 1,261 services have been laid or renewed.

In spite of the prevailing shortage of labour and materials, there has been a considerable increase in the amount of work carried out by the Fittings Department. Although there has been some increase in the man-power capable of handling this work and more meters and appliances have been available, shortage under both heads still exists.

There has been a satisfactory improvement during the year in business done in the Sales Department and sales of various types of gas appliances show a gratifying increase.

The activities of the Industrial and the Research Departments have been centralized consequent upon changes in personnel. The re-organized Department, which is now housed in new offices in our Sussex Street premises with easy access to the Research Laboratory and the Furnace Demonstration Room, has continued to keep in close touch with the industrial consumers.

I hope it is unnecessary for me to say that we have devoted considerable attention to the maintenance of the works in an efficient state. Apart from general maintenance the re-setting of the vertical retort installation at the Neepsend Works was completed during the early part of the year and the whole installation is now working satisfactorily.

Some new work has also been put in hand, among which I may mention the erection of a gasholder at the Matlock Works and a gas compressor at the Grimesthorpe Works.

The Coke Oven Gas Grid continues to operate satisfactorily, although, as I have already mentioned, the quantity of gas received has been less than during the previous year.

Increases in the wages of gas-workers, &c., have been brought into operation during the year. Improvements have also been made in the terms and conditions of service, as agreed by the National Joint Industrial Council for the Gas Industry. These include the introduction of a Sick Pay Scheme and the adoption of a scheme whereby continuous shift workers work six, but receive pay for seven shifts.

I am glad to be able to report that the amicable relations which have for so long existed between the Company and its employees have continued throughout the year.

The Special Order sanctioning the purchase of the Worsbroughdale and Worsbrough Gas Light and Coke Company, Ltd., has now been obtained and it is expected that the final completion will take place at an early date. The acquisition of this small undertaking has, due to numerous formalities, suffered many delays.

I cannot conclude without expressing the warm thanks of your Board to our General Manager, Mr. Ralph Halkett, for his close and assiduous attention to the interests of the Company, involving as they have done many journeys to London and difficult negotiations with the Ministry of Fuel and Power. I should also like to thank Mr. Halkett, Senior, for continuing to place at our disposal his unique knowledge of the Gas Industry and rendering us most useful service. Our gratitude is also due to all our officials for their loyal co-operation, which we much appreciate.

The Report and Accounts were adopted.

Brighton, Hove, and Worthing Gas Company

The Annual General Meeting of Brighton, Hove, and Worthing Gas Company was held on Mar. 14 at the Company's offices, 5, Great Winchester Street, London, E.C. Mr. A. M. Paddon, M.Inst.C.E., the Chairman, presided.

The SECRETARY, Mr. G. Murray Burton, M.A., F.C.A., having read the notice convening the meeting,

The CHAIRMAN said: Gentlemen, I wish in the first instance to refer to the paragraph in the Report which tells us that we have lost from our number Lord Cautley. Having been closely—I might say intimately—associated with him professionally for over 40 years, I feel that I am qualified to pay a tribute to his memory. He was a very great lawyer and his practice and knowledge of the law extended to almost every branch of jurisprudence, which is not always the case with counsel. Politically he was rather a statesman than a politician. His great gifts and experience—and I might add, influence—were always at the disposal of his colleagues here and we have suffered a very severe loss by his death.

Expansion of Business

The business of the Company has expanded during the year, with an increase in the sales of gas which is practically consistent with the experience of almost all gas undertakings, while I am sure you have acquainted yourselves with the statement in the Report that you are to receive a salutary increase in the dividend. Coming to the Accounts themselves, I do not propose to go into them in great detail because the only useful purpose served by so doing is to give you a comparison between them and previous workings of the Company. Owing to the frequent increases in wages, costs and other items, that comparison would be purely illusory, because they would not bear any such relation to each other as would establish a satisfactory comparison.

With regard to the Capital Account, I do not think I need draw your attention to anything except to the fact that it is interesting to note that capital expended per million cu.ft. amounts to £519, which would be a low figure in normal operations without considering the circumstances in which we have been carrying on business for the past seven years.

In the case of the Revenue Account also I do not propose to go into very great detail. You will notice that our expenditure has increased by £179,365, but against that our receipts are greater by £158,589, so that there is a small disparity of £20,776, but, if we go straight forward to the summary of the results of our trading in the net revenue account, we find that whereas we brought into the account after the payment of the final dividends £24,030, we take out of the account £30,909. Thus, the position has improved, notwithstanding the decrease in the trading profit, owing to a reduction on the debit side of the Profit and Loss Account.

I do not think I need refer to the subsidiary funds beyond saying that from the Revenue Account they have benefited in the case of the Special Purposes Fund Account by £2,000 and the Renewal Fund Account by £11,000, which will have a bearing on the disparity to which I have referred.

Now I will refer to the general balance sheet and again it will not serve any purpose to go into meticulous detail. There is, however, one figure which is of importance. Our investments stand at £252,106, but there is a footnote in very small type, quite inconsistent with the importance of the matter, to the effect that the value of those securities on the closing of the account was £326,664, which shows you that we have come through the most troubled period in the history of the Gas Industry and have preserved this keystone of investments, which is of fundamental importance to our future operations. I do not think I need refer at any greater length to the Accounts for the reasons that I have given you.

Problematical Future

You will probably expect me to refer briefly to the prospects of the Company, and that involves a very complicated issue indeed, because it is dominated by the question of nationalization, as to which we are not completely informed in all its bearings. We are compelled, however, to draw certain inferences from what has transpired and what has been published by the Government in regard to other major utility industries. It may seem a little incongruous and paradoxical that under sentence of death, as we practically are as an undertaking, we should devote such close attention to the administration of the Company, both at present and for the future, but it must be remembered that up to the very last hour of the existence of this undertaking we are under statutory obligations which we must carry out to the best of our ability, and therefore the Accounts bear much the same complexion as those of a normal trading period.

We have another obligation and that is to the consumers whom we have served for so many years with, I hope, a certain measure of satisfaction and success. We must see that, as far as rests with us, their future interests are not prejudiced or neglected in the administration of the undertaking. Both the proprietors and the consumers have to sustain a certain menace to their interests in the future. The proprietors must lose a field of investment which they have entirely created by themselves; they will be deprived of something which they have established by their own skill and industry.

Apart from that, there must be brought into consideration the question of such compensation as the proprietors may hope to receive on the consummation of nationalization, and again there is uncertainty, but, bringing in such evidence as we can from what has already transpired, it must appear inevitable that the re-investment of any such compensation must be attended by a serious reduction of income. There is a popular conception that capital consists of the proprietorship of very important and very rich people, but a colleague of mine has favoured me with some figures which I think are very interesting. They show that 87% of our stockholders own less than £1,000 each, and £1,000 does not bring in a very large annual income. Then there are 74% who own under £500 and it is obvious from these figures that the stock of the Company is held by a large number of people of limited means. If, therefore, on re-investment there is any curtailment of income, a very great hardship must inevitably be created, and that must be borne in mind when we contemplate what we are threatened with.

Another thing to which I might draw attention is that under nationalization the close and intimate relationship between the Company and its customers must disappear because the Brighton, Hove, and Worthing Gas Company will simply become an unrecognizable element in the volume of Ministerial administration, something which cannot be identified or recognized. That cannot redound to the benefit of the consumer, who hitherto has enjoyed close contact with the Company, whereby his requirements received immediate attention and sympathetic treatment.

It is gratifying for me to be able to tell you that during these troubled months—and you know how troubled they have been in the Metropolis and other places by reason of the curtailment of supplies of electricity and so forth—we have not failed to maintain a satisfactory volume of supply throughout our area, which is a very large one, so that, if we are called to account we shall at least hand over an undertaking which reflects both the skill and the experience of those who have grown up with the Industry, and those qualifications I cannot but believe will be lacking where the same duties are handed over to an impersonal and, I might almost say, irresponsible body, under Governmental control.

The Report and Accounts were unanimously adopted and the proposed dividends were approved.

The retiring Directors, Mr. Frank H. Jones, M.Inst.C.E., and Mr. William Cash, J.P., F.C.A., were re-elected.

Mr. Douglas A. Clarke, LL.B., F.C.A., was re-elected an Auditor,

and Lieut.-Col. W. C. Smith, D.S.O., M.C., F.C.A., was appointed Special Auditor to work in conjunction with the Special Auditor appointed by the Corporation of Brighton.

On the proposition of the CHAIRMAN, a cordial vote of thanks was passed to the officials and staff and a similar compliment to the Chairman and Directors concluded the proceedings.

Gas Undertakings' Results

Farnham Gas and Electricity Company.—Profit on the gas revenue account for 1946 was £21,696, against £17,840 for the previous year. The balance of net profit was £19,958, and payment of a dividend of 6%, the same as before, leaves an undivided balance of £16,718, compared with £11,165 brought forward from 1945. Gas sales totalled 2,169,140 therms.

Gloucester Gas Light Company.—Of a total revenue of £397,679 for the year ended Dec. 31, £24,749 (against £22,211) was carried to profit and loss account. A final dividend of 2½% makes 5% for the year, the same as for 1945, and leaves £19,267 to be carried forward. Gas sales during the year showed a decrease of 969,000 cu.ft., or 0.086% compared with the previous 12 months.

Dunfermline Gas Department.—Gross profit for the year ended May 15, 1946, was £20,094, but repayment of loans (£11,000) and other items totalling £20,560 (less a balance of £211 from the previous year) resulted in a net deficit of £255. Gas sales increased by 11.3% to 623,778,000 cu.ft. Including purchase price, a total of £412,406 has been spent on the undertaking, and the outstanding loan debt is now £61,967.

Watford and St. Albans Gas Company.—Balance of revenue for 1946, after charging depreciation and obsolescence and making provision for war damage insurance, was £95,064, against £92,621. Final dividends at standard rates on Preference stock and at 2½% on Ordinary stock, making 5% for the year, the same as for 1945, were declared at the annual meeting on Feb. 28, leaving a balance of £29,852. Gas sales increased by over 7½% to 16,620,000 therms.

East Surrey Gas Company.—A final dividend of 5%, the same as before, was declared at the annual meeting on Feb. 26. Gas sales for 1946 totalled 3,963,270 therms and yielded £265,720, against £229,729 for the previous year. Of a total revenue of £364,859, a balance of £37,510 (against £36,893) was carried to profit and loss account. The balance of net profit was £10,962, and the payment of dividends leaves £3,919 to be carried forward, against £3,333 brought in.

Bath Gas Company.—Of a total revenue of £591,339, a balance of £34,285 was carried to profit and loss account. Gas sales, nearly 9% up on the previous year, yielded £368,714, an increase of £25,167. Manufacturing costs at £445,558 were £55,020 more than in 1945, and the Company was obliged to increase the price of gas by a penny per therm from the end of December. Prices had not previously been increased since July, 1942. The dividend remains at 5%.

Isle of Thanet Gas Light and Coke Company.—Further recovery from wartime difficulties is shown by the fact that gas sales in 1946 were 449 million cu.ft., compared with 292 million cu.ft. in 1945, an increase of about 53%. This increase has enabled the Company to reduce the price of gas from 15d. to 13.8d. per therm as from Jan. 1 this year. The balance carried to profit and loss account was £22,077, and the dividend is maintained at 5%, leaving £9,500 to be carried forward.

Ipswich Gas Light Company.—Although there was an increase of 10% in gas sales, rising costs of coal, wages, and expenses more than offset the increase in revenue. Net revenue for the year was £26,244. A dividend of 5½%, the same as for the previous year, has been declared on the Consolidated stock, absorbing £5,016 and leaving £8,744 to be carried forward.

Weymouth Consumers Gas Company.—Gas sales in 1946 amounted to 1,738,328 therms, an increase of 6.6% over the previous year. Manufacturing costs at £100,221 were £10,813 higher and income from the sale of gas at £96,452 showed an increase of £11,316. The balance carried to net revenue was £9,357, against £11,798. An Ordinary dividend of 5%, the same as for the previous year, has been declared, and the balance carried forward is £2,093, compared with £3,151 brought in.

Gas Stocks and Shares

The most notable changes during the past week have been a rise of 1s. 6d. in Primitiva Holdings Ordinary and a further rise from 139-144 to 142-147 in Montevideo Gas and Dry Dock Ordinary. Despite the uncertain compensation outlook by the Chairman at the annual meeting, Newcastle-upon-Tyne and Gateshead Consolidated showed a rise of 3d., and the 4% Preference recovered one-quarter to 100½-102½. Bristol 5% Maximum showed a fall of nine points on the week, and the ex-dividend quotations for a number of gas companies were slightly down. The following were the price changes during the week:

SUPPLEMENTARY LIST

Cheltenham 5 p.c. cons. ord. (x.d.)	103	—108	Mar. 12
Eastbourne "B" 3½ p.c. (x.d.)	90	—100	Mar. 12
Plymouth & Stonehouse 5 p.c. deb. (x.d.)	117	—122	Mar. 12

OFFICIAL LIST

Alliance & Dublin ord. (x.d.)	22/6	— 24/6	Mar. 12
Assoc. Gas & Water Und. 4½ p.c. red. cum. pref. (x.d.)	20/	— 22/	Mar. 12
Do. 4 p.c. red. cum. pref. (x.d.)	19/6	— 21/6	Mar. 12
Do. 4 p.c. irred. cum. pref. (x.d.)	19/—	21/—	Mar. 12
British Gas Light ord. (x.d.)	115	—125	Mar. 12
Imperial Continental cap.	118	—123	— 2
Mid Southern Utility "C" cons.	100	—105	— 2
Montevideo Ltd.	142	—147	+ 3
Primitiva Holdings Ltd. ord.	13/6	— 15/6	+ 1/6
Swindon ord. (x.d.)	117	—122	Mar 12.
Tottenham & District ord. (x.d.)	107	—112	Mar. 12
Do. 5 p.c. pref. (x.d.)	107	—112	Mar. 12

PROVINCIAL EXCHANGES.

Bath cons. (x.d.)	110	—115	Mar. 12
Bristol Gas Co. 5 p.c. max.	105	—110	— 9
Do. 5 p.c. deb.	123	—128	— 4
Newcastle & Gateshead con.	24/9	— 25/3	+ 3d.
Do. 4 p.c. pref.	100¼	—102½	+ ¼
Weston-super-Mare cons.	105	—110	— 3

Gas Products Prices

The London Market

Mar. 14.

There are no changes to report in the prices of Coal Tar products, to-day's values for some of the main materials being as follows:—

Road Tar is 6½d. per gall. filled into buyer's tank at seller's works and the prices for other methods of collection or delivery are laid down by Government Order S.R. & O. 1947, No. 177.

The prices of *Naphthalene* are also governed by the same Order. *Crude Naphthalene* prices range from £8 1s. to £12 13s. per ton according to grade for minimum 4 ton lots ex seller's works, bags free. Hot Pressed Naphthalene is £15 14s. per ton, bags free ex producer's works.

Refined Naphthalene prices range from £29 2s. per ton for Crystal in bags to £35 5s. per ton in 1 cwt. cases; Ball and Flaked Naphthalene from £32 6s. 6d. per ton in bags to £38 9s. 6d. per ton in 1 cwt. cases. These prices are for minimum 4 ton lots delivered carriage paid buyer's address.

Pitch for briquetting is 75s. per ton loose in bulk ex producer's works.

Creosote for timber preservation is 5½d. per gall. in bulk ex seller's works in minimum 800 gall. lots.

Cresylic Acid prices range from 3s. 6d. to 5s. per gall. ex maker's works according to grade.

Coal Tar Naphtha prices range from 1s. 11d. to 2s. 11d. per gall, and *Xylol* prices from 3s. 3½d. to 3s. 6d. per gall. in 1,000 gall. lots carriage paid buyer's address in bulk.

The Provinces

March 17.

Average prices for gas-works products: Pitch, 75s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6½d. per gall.; pure, 3s. 2½d. Prices for carbolic acid 60's anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.) and strained anthracene oil are controlled by Government Orders. Prices for road tar are increased by one penny per gall. by S. R. & O. 1947, 177, under which Order there are also increases in the prices of naphthalene.

Scotland

Mar. 15.

Throughput is well maintained despite adverse conditions.

*Refined Tar.** Yield to the distiller is 6d. per gall. ex works, naked. *Creosote Oil.* Timber preserving quality* 5½d. to 6½d. per gall.; Hydrogenation Oil* 5⅞d. per gall.; Low Gravity or Virgin Oil† 7½d. to 7½d. per gall.; Benzol Absorbing Oil 6½d. to 8d. per gall. *Refined Cresylic Acid* is 3s. 6d. to 4s. 6d. per gall. ex works, naked, according to quality. *Crude Naphtha*† 7d. to 8d. per gall. *Solvent Naphtha.** Basic maximum prices delivered in bulk 90/160 grade, 2s. 10d. per gall., and 90/190 Heavy Naphtha, unrectified, 2s. 0½d. per gall.; Rectified, 2s. 4d. per gall. *Pyridine.*† 90/160 grade 15s. per gall., and 90/140 grade 17s. per gall.

* Price controlled. † Uncontrolled.